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THE MOUNT EVEREST EXPEDITION OF 1938

H. W. TILMAN

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THAT this year's expedition to Mount Everest was organized on a smaller scale than before is well known. For some time past a few have inveighed against the large expedition on more grounds than one—mobility, efficiency expediency, and economy—but it was probably the financial aspect that finally tipped the scale, especially after the experience of 1936 when, through no fault of those concerned, the party was unable to accomplish anything. It was felt that the time had come to give other methods a trial, if only for the reason that they were less expensive.

Permission to go this time was obtained through the persuasive powers of Mr. B. J. Gould, whose Mission visited Lhasa in the winter of 1936. The Committee having appointed a leader gave him a free hand, and, since the money was raised privately through the generosity of friends and members of the party, they were also spared financial responsibility. A satisfactory arrangement was made with *The Times*, but it is a matter for regret on our part that through an unfortunate incident the terms of the contract were not fulfilled by us. We budgeted for a cost of something less than a quarter of previous expeditions.

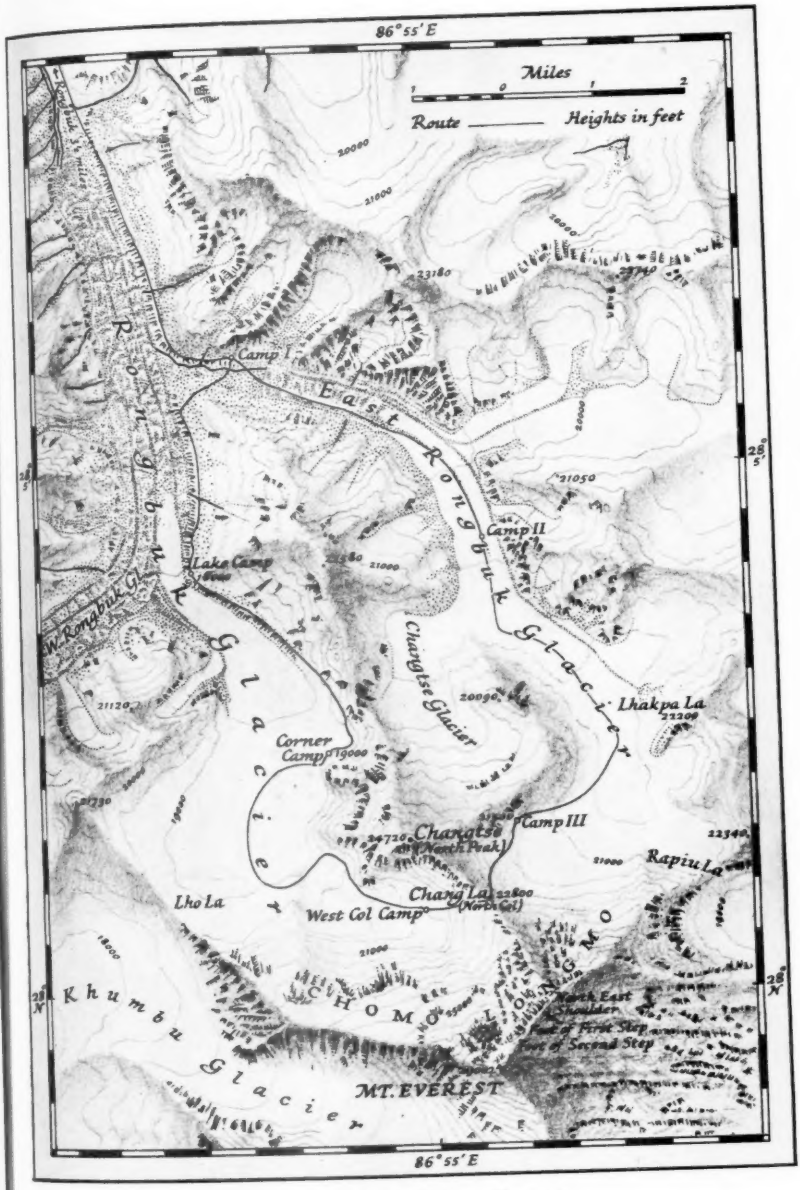
The party which assembled in India at the end of February consisted of seven, all of whom were climbers: H. W. Tilman, E. E. Shipton, F. S. Smythe, N. E. Odell, Dr. C. B. M. Warren, P. Lloyd, Captain P. R. Oliver. A dozen Sherpa porters were collected in Darjeeling, and the party left Gangtok on March 4 with sixty mules carrying the baggage. A week was spent at Tangu, where snow still lay deep, through which a track for the mules was cleared with the whole-hearted assistance of the Sikkim Road Engineer. The Sebu La was crossed on March 18 on a cold blustery day, but thereafter throughout the march across Tibet we enjoyed bright sunny days marred only by the wind which blew usually in the afternoons.

We reached Rongbuk on April 6, ten days earlier than the earliest of previous expeditions, having taken the precaution of being there in time to avoid a repetition of the 1936 experience. As will be related the weather did break

early, even earlier than in 1936, but until it broke the wind and cold made climbing impossible. The day after our arrival we were joined by forty-five Sherpas, who came over from Sola Khombu in accordance with arrangements, bringing with them 1300 lb. of food. They came by a 19,000-foot pass called the Nangpa La and the journey takes about a week. As women and children cross the pass later in the season, it must be easy; but we were told that no animal transport ever uses it because the guardian spirit of the pass takes the form of a horse, and any four-footed animal which presumes to cross is at once struck dead.

In spite of the mild conditions of the march, wind and dust had taken their usual toll: Oliver and Lloyd had colds, Odell a bad cough, Warren went to bed with what was called influenza, and Shipton with colic. After the usual ceremonies at the monastery, when the old Abbot blessed the whole party, Europeans and Sherpas, individually, we moved up to the original Base Camp. This was used only as a halting place; we took with us up the glacier everything we required and had no lines of communication to bother about. After making one carry to Camp I we reduced our porter strength from sixty-one to thirty-one, because we were in no great hurry to reach the mountain owing to the prevailing cold and wind. With this reduced porter strength four relays to each camp up the glacier were necessary, and it was not until April 18 that we occupied Camp 2. There I went down with influenza and after four days in bed went down to Rongbuk on the 22nd. Before I went we discussed plans, and decided that after the North Col slopes had been examined Shipton and Smythe should go over to the Kharta valley for a rest, leaving the others to carry on and make an attempt if conditions allowed. The reason for this was that Shipton and Smythe, who had had most experience and were our most likely pair, were of the opinion that the end of May was the most probable time for an attempt and were averse from making an earlier one.

On the 26th I returned to Camp 3 where the others now were. They reported much ice on the North Col slopes and were not in favour of doing anything more yet on account of the extremely cold conditions. Temperatures of 46 and 47 degrees of frost at night were being recorded; moreover none of the party was fit: coughs, colds, and sore throats were the tale of our infirmities, and on Mount Everest the only cure for these complaints is a lower altitude. On the 27th therefore Shipton, Smythe, Oliver, and nine men crossed the Lhakpa La (22,000 feet) *en route* for the Kharta valley. The rest of us waited a couple of days and then followed them, the wind and cold showing no signs of abating. The alternatives to this move were to stay and carry on, or to go down to Rongbuk, which was nearer to the mountain but less beneficial to health. Before leaving England I had been strongly warned by Norton, who in 1924 had suffered in the same way, against committing the party too early with the probable result of putting some of us out of action with frostbite; and such were the conditions at this time that this was less of a probability than a certainty for any party above the North Col. Nor, as things turned out, would mere proximity to the mountain by our being at Rongbuk have helped us. Bitter weather continued until May 5, when snow fell heavily and fell daily for the next week. The mountain turned white and was never again in climbable condition.



The approach to Mount Everest

The courtyard of Rongbuk monastery

Our camp amongst grass and trees at the head of the Arun gorge was a change from the harsh conditions of the glacier camps. All enjoyed their stay there except myself, who went to bed on arrival with a recurrence of influenza and only left it to begin the march back on May 10. Shipton and Smythe stayed behind intending to return by the Lhakpa La in time to meet us at Camp 3 on May 20. We returned by the Doya La and reached Rongbuk again on the 14th, whence our first view of the mountain was not reassuring. It was covered with snow and the plume was now blowing off the summit from the reverse of the familiar north-west direction. On reaching Camp 3 on May 18 we found drastic evidence of changed conditions: a foot of snow now covered the bare ice of the glacier, and water lay about in pools whereas before water was only obtainable by melting ice.

Early on May 19 clouds poured up over the Rapiu La in ominous fashion bringing in their train intermittent falls of snow; but Odell and Oliver having examined the North Col slopes reported the snow in good condition. Lloyd was sickening for his turn of our common complaint, but on the 20th four of us and four Sherpas began making a route up to the Col. The line we took almost directly up the middle was undoubtedly well adapted to act as an avalanche shoot, but the snow was good and the climbing easy until within about 300 feet of the top, when the angle steepened considerably, forcing us out to the left on a long traverse before we were again able to climb straight up. Oliver, who had done most of the work in front with his two Sherpas, was suspicious of the snow on the traverse and waited until the rest of us had come up before embarking on it with his two men, carrying a light line for fixing. A short way out they got bunched and the snow avalanched. The leading man, a Sherpa, was clear of the cleavage, and the line we were paying out got mixed up in their climbing rope so that we easily held them. Part of the route having thus been made safe, Odell and I took over the job of cutting and stamping out a track in the steep, soft snow. It was so hot that a little of this work was enough to send us back to camp at 4 p.m., where we found Shipton and Smythe, who had recrossed the Lhakpa La early that morning. They had watched our performance with interest and anxiety and were glad to see us coming down. That evening it snowed steadily for several hours and the roar of the resulting avalanches continued far into the night.

This heavy fall of snow gave rise to discussion. The slopes would be unsafe for three or four days, while if the wind for which we prayed came the probable formation of windslab might make them dangerous for an indefinite period. Having in mind the queer behaviour of the snow here in previous years our thoughts began to turn to the route up the west side, which had been warmly recommended by the 1936 party who had looked at it but not gone up it. We decided that Shipton and Smythe, taking half the porters, should go round, and if they succeeded in reaching the Col should attempt the mountain. The contemplated division left both parties weak in porters, but it promised that one or other would reach the Col.

A cold windy night followed by a promise of colder weather made us drop the plan for the moment, and next day, having examined the slopes, their condition seemed good enough to warrant a start. On May 24, all the

Europeans, less Lloyd who went down to recuperate, and twenty-five porters went up to the Col. The route to the top was soon finished, ropes fixed, and by midday all were up. Loads were dumped on the 1936 site where the apex of one of their Pyramid tents showed through the snow. Next day Smythe and I took fifteen more porters up; we left early, were on the top by 10 a.m., and back in camp by midday. The outlook from the Col was as depressing as from below. Clouds could be seen billowing up from both sides, the air was still, the mountain white, and the snow at our feet, deep and soft. More discussion followed, when it was decided that Shipton and Smythe should retire to Rongbuk, returning when the mountain was less white, and that we others should occupy the Col in order to examine the snow higher up. Uncertain whether the west side would be practicable, we were reluctant to commit ourselves to that yet; meanwhile it was no good keeping more men than needful at Camp 3. Nevertheless, when more snow fell the following day we reverted to the earlier plan, and on the 27th Shipton, Smythe, and half the porters went down, with the intention of returning by the west side when conditions improved.

On the 28th Odell, Oliver, Warren, myself, and thirteen porters, went up to Camp 4 on the Col. It was very hot, mist hung over the slopes, and the snow in places was rotting; we crossed the traverse one by one. Eight porters went down with orders to return next day with more loads if no snow fell, but a foot of snow fell that night, so nothing was done. There was more snow on the 29th, but on the 30th Oliver went off to examine from the end of a rope the snow on the western slopes and the rest of us toiled through knee-deep snow up the north ridge. Warren tried the closed type oxygen apparatus with unlooked for results. It seemed bent on suffocating him, and he did not wear it long. In addition to two of the closed type apparatus in which pure oxygen is breathed by means of a mask over mouth and nose, and which weighs 35 lb., we had two of the simpler open type with which one obtains oxygen by a tube in the mouth and also whatever air is available through the nose. Professor Finch was alone in recommending this type, the comparative success of which was instructive.

I pushed on with a Sherpa to about 24,500 feet, but it was obviously no use trying to occupy Camp 5 yet, and when more snow fell that day we beat a retreat. A suggestion that two of us should go down by the west side was not accepted owing to Oliver's account of the snow. On June 1 we were at Camp 1, whence, next morning, Oliver and I walked up to Lake Camp to see Shipton, Smythe, and Lloyd, who were on their way to the western approach. The camp is a pleasant spot by a tarn on the right moraine of the main glacier some 2 miles above Camp 1. A change had come over the weather and for the last forty-eight hours a strong west wind had been driving low clouds before it. Through breaks in the flying scud we could see snow being whirled off the face of the mountain in a most encouraging manner, but while the wind might clear the snow off it might also form windslab on the east or lee side slopes; we therefore bowed to Smythe's reiterated warnings, and decided to concentrate on an approach from the west. I joined Shipton's party, which we reinforced to a strength of seventeen porters, and the others were told to follow as soon as some necessary loads had been brought down

Bridge above Tangu

West side of the North Col, showing the avalanche debris

Looking west from Camp V

from Camp 3. After making an intermediate camp on June 4 on the main glacier (Corner Camp), we marched up the short glacier lying between the north face of the mountain and the North Peak, leading to the foot of the west side of the Col. Mist caused some difficulty amongst the crevasses of the icefall, but by 2 p.m. we were in camp (West Side Camp) on the snow terrace at the foot of the slope. The height must be about the same as Camp 3 (21,500 feet). Snow was still blowing about on the Col and the Yellow Band looked fairly free from snow, but we were about to learn that appearances from below were deceptive.

Our way next morning led up the debris of a large avalanche which had apparently fallen recently. In consequence the first 500 feet of the slope was bare ice, and after cutting steps up this we had to cut steps across it in order to get on to snow which was still in place and which at that early hour might be expected to remain there. On the whole the parties who left this route alone in previous years seem to have had reason. We reached Camp 4 at 11 a.m. after a long plug up bad snow on which even the feeble sun there was had no good effect. The sky had a curious glassy look through which the sun peered wanly surrounded by a double halo.

Next morning, June 6, we started with fifteen porters for Camp 5. Lloyd was wearing the open type apparatus. The snow slope at the foot of the north ridge up which we had ploughed so heavily a week ago had now been swept hard by the wind. Approaching 25,000 feet two porters succumbed to altitude and most of the others were unhappy, while yet 300 feet below the Camp 5 site (25,800 feet) a sudden snowstorm further demoralized them and there was talk of dumping the loads and going down. In the end however better feelings prevailed, and by 4 p.m. everybody was up. Leaving Shipton, Smythe, and seven porters there, Lloyd and I took the rest down. Two of those seven actually went down several hundred feet that evening and brought up the two abandoned loads—a very fine piece of work.

Wind prevented the Camp 5 party doing anything next day, but on the 8th they moved up to Camp 6 (27,200 feet), finding it hard work making a track up fairly steep rocks which in many places were snow covered. The climb of 1400 feet took eight hours, and the seven porters, who stuck nobly to their task, only got back to Camp 5 very late and very tired. On the 9th Shipton and Smythe started, but, like Lloyd and I later, they were out too early and had to go back to the tent to warm up. Finally, after leaving the little patch of scree on which Camp 6 was pitched, they struck diagonally upwards, but almost at once got into deep powder snow. Realizing the futility of persevering under those conditions, they returned to the tent and thence down to the North Col.

Meantime Lloyd and I had a day off at Camp 4, took three sick men down by the west side, and then, on the day Shipton and Smythe were returning, he and I started up with six porters. As we were going up to Camp 5 we saw Odell, Warren, Oliver, and two porters coming up to Camp 4 from the west side camp. Farther up we passed the seven porters returning from Camp 5, and in that camp, which we reached at 3 p.m., we met Shipton and Smythe also on their way down. After hearing their report of conditions higher up, we agreed that the summit was out of the question and decided to reach if

Looking west from Camp V

West side of the North Col, showing the avalanche debris

possible the summit ridge and to work along it to the Second Step. Two of our porters were persuaded to stay, the rest went down.

A gale in the night made the double-skinned Pyramid tent flap so furiously that sleep was impossible. Leaving at 8 a.m. we reached Camp 6 soon after midday. Lloyd, wearing the oxygen, led and I followed, roped to the two porters. He got in some half an hour ahead of us evidently feeling more benefit from the oxygen as we got higher. For the short distance we went next day he also moved faster than I did, but perhaps under the circumstances that was no criterion. What I did expect was that the oxygen would give him sufficient extra "kick" to climb the rocks which so easily defeated us next day; but Lloyd's opinion is that less effort was required when moving and consequently he was merely less fatigued. We sent the men down, collected snow for cooking, and turned in, for the wind was already rising. We ate pemmican soup for supper. At night it blew hard and we slept little.

Starting at 8 a.m. on June 11 in a very gentle breeze we had not been going ten minutes before my hands were numb and Lloyd complained that his feet were in almost the same state. We returned to the tent and waited until 10.30 before trying again. As our first objective was the summit ridge immediately west of the north-east shoulder, we had to climb a steep rock wall some 50 feet high, just above the camp. Not liking the look of this from closer up we turned half-right towards an upwards sloping snow corridor, but there a few thigh-deep steps quickly drove us back to our first choice. There were three or four possible lines up the rock, all of which we tried with an equal lack of success. Each looked simple enough, but the smooth outward-sloping rock easily defeated our irresolute attacks. As I was inspecting the fourth and last possibility, Angtharkay and another man whom we had told to come up, were seen approaching the tent. Here was an excuse for going down, had we been in want of one, so down we went. If we had gained the summit ridge then some 200 feet above us we should have been a mile distant from the summit and 1500 feet below it, and 1200 yards from the Second Step. The ridge looked difficult and the Second Step would almost certainly have defeated us, but it will be a lasting regret that we were unable to try.

We descended to Camp 5 in a storm and reached Camp 4 that evening in calm weather. Only Odell, Oliver, and a few porters remained on the Col, the others having gone down by the old route that morning. Ongdi, one of our best men, had developed pneumonia, which obliged Warren to go down with him. Pasang, another Camp 6 man, was lying paralysed. Oliver was keen to go to Camp 6, but having a sick man on our hands, no hope of climbing the mountain, and some anxiety about the descent, the prudent course was to go down. The ice traverse put the western route out of court for getting a helpless man down, and on June 12 we descended by the old familiar way. Three men were kept back to look after Pasang, and after some difficulty we got him down to the glacier and thence to Camp 3.

Thus ended the 1938 attempt. We halted at Rongbuk until June 20, but in the interim the weather gave us no encouragement to stay. There was talk of returning in the autumn, but none of the party was available, and the chances of finding favourable conditions in October are, in my opinion, exceedingly remote. Assuming the unlikely fact that by then the wind has

Camp V at 25,600 feet

cleared the snow away, the wind and cold are increasing instead of diminishing, the days getting shorter, and the north face receiving less and less sun.

To sum up, I think we have shown that a small party costing less than £2500 is as likely to reach the top as a large one costing £10,000. Two parties of two were in position at 27,200 feet, fit and ready to make a serious bid for the summit had conditions allowed. It would have been more convincing to have reached the top, but I believe enough was done to satisfy candid people that our methods are sound.

We learnt, as had already been learnt twice before, that it is impossible to climb the last 2000 feet if there is snow on the rocks. Siege tactics are impracticable at that height, but even if the labour of ploughing through powder snow was not insuperable there is the danger of the snow sliding off. Though wind seems capable of impacting snow up to about 25,000 feet it seems to have no such effect on snow above that.

The fact that we took no wireless equipment seems to have caused some surprise, but I do not see how even a small receiving set would have benefited us this year, and why a mountaineering party should wish to take a transmitting set is difficult to understand. This year we might have been told in the first days of May that a disturbance was approaching, but the news would not have caused us to alter our plan of making the attempt at the end of the month, because at the time no earlier attempt was possible. Even supposing some omniscient being had told us that from May 5 onwards monsoon conditions would prevail (as they did) we should certainly have been well informed but unable to do anything about it except, perhaps, pack up.

Something has been learnt about oxygen, but my own belief is that the mountain could and should be climbed without it. The opinion of a representative body of mountaineers has not been taken, but my feeling is that a successful oxygen attempt would merely inspire a wish to do it without. No finality would be reached, and the ultimate result would be another long-drawn series of attempts to climb the mountain in a normal way.

To conclude: the weather is all important, and for success conditions on the last 2000 feet must be perfect. In 1936 and 1938 there was great hope that the mountain would be climbed, and yet in neither year was a bid for the top ever possible. Whether with a system of attempts at haphazard intervals the dice are not too heavily loaded is a question that will have to be decided.

APPENDIX I: THE GYANGKAR (NYONNO RI) RANGE

E. E. SHIPTON

The Gyangkar range is interesting geologically as being one of the few mountain chains of central Asia with a north–south axis. It is a feature very well known to members of the various Mount Everest expeditions, but although five of its main peaks were fixed on the 1921 reconnaissance map no part of it was examined closely by that expedition. In 1922 Mallory, Somervell, Finch, and Wakefield attempted from two directions to climb Sangkar Ri in the extreme north of the range. In 1933 Wager and I climbed a small peak on its eastern flanks, and Wager did some geological work.

In planning the 1935 reconnaissance a visit to the range had formed a part of our programme, and thanks to the friendliness of the local officials at Sar,

The Gyangkar range seen from 27,200 feet on Mount Everest

in the middle basin of the Yaru Chu, Spender was able to photograph the eastern flanks of the main range, the valleys of which are short. Tilman, Kempson, and Warren attempted to climb Nyonno Ri (22,142 feet), the highest peak in the range, and supplemented Spender's observations to the south-west. Wigram and I crossed a pass to the north and reached an isolated basin of pastureland lying to the west of Nyonno Ri and shut in on all sides by high peaks. We found that this country was grazed by large herds of yaks and sheep belonging to the people of the surrounding districts. We traversed the basin to the south and found our way back to Sar by way of a pass between the Nyonno Ri and Ama Drime groups. I hoped then to take the whole party across the range and to make a detailed exploration of those interesting and very beautiful western valleys. Unfortunately political considerations forced me to abandon this plan. I have always regretted this, and have looked for opportunities of renewing my acquaintance with the Gyangkar range and of extending our knowledge of it to the west.

This year I succeeded in spending a short time in the range on the way home. With two Sherpas, Kusang Namgir and Gyalgen, I left the main party at Trangso Chumbab on June 26. One pony carried all our food and equipment. The local knowledge of the owner of the pony enabled us to cross the Yaru Tsangpo, which is dangerous hereabouts owing to quicksand, at its junction with the Phung Chu, and so to reach Kochak on the first day. There I found that distribution of boiled sweets among the village children was an excellent way of breaking down the reserve among their elders.

I induced an old man to come, with two donkeys, to help us into the valleys to the south, and on June 27 we reached a monastery far up in the mountains. Beyond this our guide would not go, saying that there was no route and that we would only get lost if we went farther; though he must have known of the grazing country to the south. From the monastery we had to carry our baggage ourselves. We had to cross a series of high ridges which separated deep grassy valleys flowing west from the axis of the range. Each of these valleys is used as a grazing ground by the people of the Phung Chu. In one of them we met two men hunting for bharal. The men told us that these high valleys were mostly used in the winter for grazing. This surprised me for I had imagined that their slopes would be deeply covered in snow in the winter; but the Sherpas pointed out that similar valleys in Sola Khombu are used more in the winter than in the summer. Certainly these would be a pleasant resort from the bleak, wind-swept plains of Tibet.

The weather was very bad, and though we spent long hours at high stations I could not fix my position sufficiently well to sketch the northern valleys of the range. Moreover travelling in thick mist across numerous saddles was complicated. The glaciation of the mountains suggests that the weather in the whole range is influenced by the moist air coming through the Arun gorge. The vegetation too is entirely different from that of the mountains to the east and west of the range. When I was there the flowers were brilliant. Many varieties extended to over 18,000 feet.

When we reached the main basin the weather improved for a spell and I was able to do a lot of work with the small Watts theodolite. The camera attached to the instrument unfortunately broke down after the first few stations, and I had to take an enormous number of angles to minor features of the landscape which would normally have been fixed by intersection on the photographs. Panoramas of hand photographs supplemented the work.

The whole range seems to be composed of granite. The ridges are largely made up of bold rock spires, and the main peaks, where they are clear of ice, are

flanked by clean, sweeping rock faces of considerable steepness. Almost every side valley and cwm contains at least one lake. This is a remarkable feature of the country. Most of these lakes appear to be very deep indeed. Fuel was always plentiful; even where there was no scrub the ground was everywhere littered with yak-dung. This and the large number of encampments showed the extent to which these rich pastures are used. In July we met with very few herds, and obviously most of the grazing is done at another time of year, which supports the theory of a winter influx to these high valleys.

We found a tall *Meconopsis*, with a large red flower, growing in some profusion in one of the valleys. I have not seen it before, nor have I heard that it has been found before. Unfortunately there were no seeds available. I brought back some specimens of the flower which have been sent to Kew for identification.

I had hoped to explore some of the great gorges running south-east from Ama Drime to the Arun, but unfortunately by the time we reached that country our food was running short, nor had I enough money to be able to send for further supplies. This was most regrettable, for an exploration of these gorges would be extremely interesting from many points of view. As it was we were obliged to cross the same pass that Wigram and I had used in 1935. We camped by a lake about 3 miles long at the eastern foot of the pass, about 5 miles from the Nye La. The ground was strewn with gigantic granite blocks, and on top of one of these were the remains of an old fortification. These were very difficult to reach, but we managed to climb to them through a great fissure in the centre of the block, which demanded a good deal of rock-climbing skill. Later we learnt from some shepherds that the rock used to be inhabited by bandits, who for a long time preyed upon travellers crossing the Gyangkar range. At Sar we were hospitably received by our old friend the head man, who had been so kind to us in 1935.

APPENDIX II: NOTE ON THE BOTANICAL COLLECTION

C. E. C. Fischer

A small but interesting collection of dried botanical specimens and seeds was made, mainly by Mr. Peter Lloyd; the specimens numbered 117. Though it contained no new species there were two new varieties of *Gentiana*, and several others represented types found elsewhere within the last few years, thus extending the habitat.

Though it might be thought that a route now travelled and collected over several times would not offer much opportunity for the systematic botanist in a region not particularly rich in its flora, there is every chance of obtaining further information. Specimens are secured during different seasons, in different localities, and at different levels, and sometimes these supply stages in the growth of the plant that were not previously procured. There is also the possibility of the discovery of new species or varieties (as in the present and the 1933 collections), which were either overlooked on earlier occasions or were not then in flower owing, perhaps, to the unfavourable seasonal character of the particular year. This may account for the finding of two new varieties and two other plants not collected on any previous Mount Everest expedition (*Clematis Vernayi* C. E. C. Fisch. and *Androsace Cuttingii* C. E. C. Fisch., collected some three years ago in the direction of Lhasa). Further, the range of at least five of the plants collected this year has been raised by about 1500 feet.

It is obvious that an Everest expedition must not be hampered by cumbrous burdens; but as Mr. Lloyd and others before him have shown, it is quite

possible to do some very useful collecting without any hindrance to the more immediate purpose. It is to be hoped therefore that on future expeditions some effort will be made to complement the previous collections and to enlarge our botanical knowledge of a region still very little known.

The collection (excluding seeds which have been sown at Kew and whose identification must wait till they have produced recognizable plants) comprises 31 botanical families of flowering plants, 70 genera, and 110 species. Of these 26 families, 62 genera and 92 species belong to the dicotyledons and the rest are monocotyledons. There are no conifers or cryptogams, nor were any grasses forthcoming. The best represented family is the *Papilionaceae* with 5 genera and 12 species; but the *Ranunculaceae* with 8 species, the *Cruciferae* with 9, and the *Compositae* with 7 actually had a larger number of genera (7, 8, and 6 respectively).

The localities were mostly between 14,000 and 15,000 feet, but some were at only 10,500 feet and one specimen (*Ermania himalayensis* O. E. Schulz) was found at 18,500 feet. This plant was collected in 1933 by Mr. L. R. Wager at 19,000 feet.

DISCUSSION

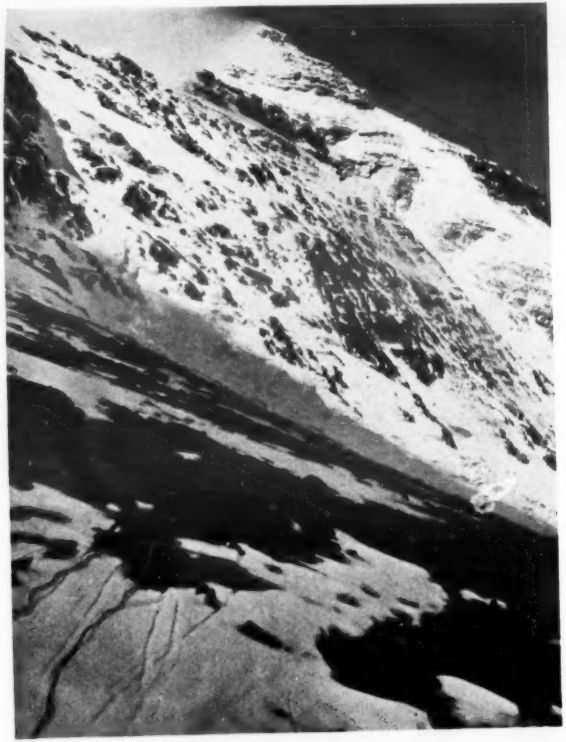
Before the paper the DEPUTY PRESIDENT (Professor KENNETH MASON) said: The President has charged me to express his great regret that public business abroad prevents him from attending here to-night, the first evening of our new session. I will straight away call upon Mr. Tilman to give his account of the Mount Everest expedition of 1938.

Mr. Tilman then read the paper printed above, and a discussion followed.

Mr. E. E. SHIPTON: I am very pleased to have this opportunity of congratulating Tilman on the way in which he ran the expedition, not at all an easy matter from various points of view. The great bugbear of an Everest expedition is that, whereas on an ordinary scientific exploratory expedition parties can be sent off into an unexplored area, each member having his own particular job, on Everest at least 75 per cent. of the time is spent in doing nothing. That fact is not generally realized. Members tend thus to become bored and to criticize unimportant things. It is difficult to organize the party so as to avoid this. The expedition this year was a pleasant one; we were all socially harmonious, and I think we all worked together well. But the question of doing nothing for long spells of time is a difficult one to get over. If I tell you that bed-sores, both physical and mental, are a greater hardship than altitude you will probably regard it as a joke; but there is quite a lot of truth in the statement.

As regards the health of the expedition, I am convinced that the party kept far fitter than in 1933, when two members were confined to their beds with 'flu for a fortnight, one other was sent to Kharta with bronchitis, another was incapacitated for months with a gastric ulcer, and we all suffered more or less severely from laryngitis, colds, etc. No party has ever been at full strength on Everest.

Although on the expedition in 1935 we tried out, with success, the small expedition idea, there are still a number who regard it with grave suspicion, but the 1938 expedition has done much to prove the contentions of those who advocate the small expedition. I now feel that if I were to argue further in favour of the small party, I should be flogging a dead horse. I should however like to draw attention to the excellent American expedition to K^2. They cut their food and equipment down a great deal further than we did and I think they gained a greater measure of success on the second highest mountain in the



The summit from Camp VI

Smythe at the foot of the Yellow Band

world; a mountain which had looked so difficult that the Duke of the Abruzzi had, thirty years previously, given it up without making a serious attempt to climb it. Until the American party went there in 1938 no other serious attempt had been made. That expedition reached an altitude on an almost completely unknown and extremely formidable mountain of about 26,000 feet: a very remarkable feat.

I do not think there can be any doubt that Mount Everest will be climbed one day, but there must be perfect weather and perfect conditions otherwise, a combination which is not nearly so common as earlier expeditions appear to have thought.

I think Tilman has told you everything there is to be told, and beyond congratulating him again on the splendid way in which he ran the expedition and the excellent manner in which he has presented it to you, there is nothing more for me to say.

Mr. F. S. SMYTHE: I should like to associate myself with everything Tilman has said with regard both to the small expedition and to the oxygen. There is a point which has impressed me very much. As you know, oxygen is supposed to be, and is, the best possible treatment of frost-bite, and yet apparently Lloyd, who was carrying oxygen, suffered from the cold just as much as did Tilman.

Another interesting point which perhaps has not been stressed is that of the cold at high altitudes. A difficulty both parties experienced was the cold in the shadow on the north face of the mountain, and I will go so far as to say that I am quite sure as a result of my own experience that the mountain cannot be climbed in shadow. I remember watching the upper part of the north face from Camp 2 in April, and as far as my memory goes the sun did not get on to it until about eight to nine in the morning. That is too late to start from Camp 6 for an attempt on the summit. Any suggestion therefore as to a post-monsoon attempt must be defeated by that one fact alone, and therefore the possibility of climbing Everest is definitely limited to that period, which we did not get, just before the monsoon.

Then as to the question of the food: Tilman alluded to the impossibility of eating anything above Camp 4, but in the next breath he said that he and Lloyd ate pemmican at Camp 6, and to any one who has eaten pemmican, I would almost say at any altitude, that is a remarkable circumstance. The usual procedure is to plan out some food for high-altitude camps, and when one gets to Camp 3 one lumps as much as one can remember of it into a rucksack and takes it up. The question of high-altitude food should be a matter for experts and for all the members of the expedition. It should be documented at the start and taken up in small boxes, each box being labelled for its particular camp. In that way the climbers might conceivably get something they had not eaten before, and that would help to get them to the top.

Dr. C. B. M. WARREN: You may have gathered from what Tilman has told you that he has a supreme distrust of scientists and doctors. I never quite knew whether to be flattered at being asked to go on the Everest expedition because I spent my spare time mountaineering, or whether to be insulted because Tilman asked me to go as a doctor. In spite however of Tilman's views about doctors in general, I shall dare to talk to you about the medical aspects of the expedition.

To begin with, we had the usual crop of sore throats, and I think Tilman is quite right when he says there is nothing very much that we can do about these once they have developed. We tried throat sprays and painting the throat, and I tried wearing the Matthews respirator, with which I think I had a certain

Western peaks of the Gyangkar range

amount of success. But the suggestion that I put forward, perhaps for future occasions, is that the leader only or a competent transport officer should lay the camps up the East Rongbuk glacier as far as Camp 3 when the weather is still very cold, and the rest of the party should be kept down in the Kharta valley at reasonable levels where they will keep fit and can practise mountaineering. Thus they would not be upset by the high altitude and the dry atmosphere until they were ready to make the actual attempt on the mountain.

In spite of the fact that a doctor on the expedition has been decried as unnecessary, we had at least one very serious medical casualty this year in our porter Pasang, who after going up to Camp 6 became completely paralysed down one side; he could not walk at all, and had to be carried and lowered the whole way down the slope of the North Col. This was most unexpected in a young man, and the question was whether the paralysis had anything to do with the altitude or whether it was just fortuitous. I cannot help feeling that there was probably some connection between the two. Certain accidents which occurred on past expeditions, when reviewed in the light of Pasang's illness, might perhaps have had a similar cause. When people go to high altitudes alterations occur in the blood as a result of acclimatization. It is not at all certain that these alterations are entirely beneficial. It may be that after a certain time there is clotting in the vessels of the brain because the blood has become more viscous, and this would cause serious accidents such as this case of paralysis.

I would like to support Smythe's remarks as to the diet. I think it is most important on Everest, from the medical point of view at any rate and because we want to keep people from getting what we call intercurrent infections, that they should be well nourished. Not only should they have their vitamins, which is easily managed nowadays, but they should have an adequate diet. As it is almost impossible for members of the expedition to eat a proper diet at high altitudes above Camp 3 I think it is all the more important that they should have a very carefully worked out diet at the lower levels. When we went over to the Kharta valley this year we had to travel light because we were going over a high pass; but the idea of going there was to recuperate. And yet we seemed to spend most of our time feeling hungry on the way down there and feeling hungry when we had reached the valley of plenty I suggest that in future a dietician should always be consulted before an expedition goes out. After all, he has spent most of his life carefully studying diets, and even though you do not accept what he says you would at any rate get expert advice.

I have been asked to say a word or two about oxygen, but Lloyd will give you more indication as to whether it was successful on the mountain or not. We had two kinds of oxygen apparatus with us. In one type the wearer breathed pure oxygen and all the external air was excluded; in the other type he breathed oxygen which was diluted with air. Both types of apparatus had been tried out at home, but I made special tests with the newer closed type, in which only oxygen is breathed. In 1937 I took it out to the Alps and climbed the Matterhorn in it, the Wellenkuppe, and one or two other mountains, to see whether one could really climb steep rocks. Mechanically the apparatus worked extremely well. The only drawback was that those mountains were not high enough to enable one to decide whether there were any beneficial effects from the use of the gas. So we took out both types of apparatus this year. When I went on the North Col the first time I tried the closed apparatus, and what Tilman has said about my reactions is more or less accurate. When wearing the apparatus I was completely free of fatigue in going uphill, but there was a feeling of suffocation of which it is hard to localize the cause, unless it lay in the

Valley in the central basin of the Gyangkar range

The country south-west of Ama Drime

Nyonno Ri from the west

A lake near Nye La; with rock fortress on the right

fact that the design had been altered slightly at the last moment. I do not think that one can entirely rule out of court the closed type of apparatus on that account; I think it should be given further trials. The other type of apparatus I was not able to try myself because I had to go down off the Col, but Lloyd will tell you how he climbed above Camp 6 in it, and give you his reactions.

Mr. PETER LLOYD: We have heard a lot of hard words this evening about oxygen, not only from Tilman but also from Smythe. I have a lot of sympathy with the sentimental objection to its use, and would far rather see the mountain climbed without it than with; but on the other hand I would rather see the mountain climbed with it than not at all. Climbing Everest is not, after all, like a game of cricket, for which you can make rules as to what is fair and what is not. It is a big enough proposition to demand all the forces that we can bring to bear against it.

Warren has told you of, and Tilman also mentioned, the two types of apparatus that we had with us this year. It was a distinct disadvantage in many ways having to take both types with us, but having them both there it was obviously desirable that we should try to test them under the actual conditions above the North Col. That is the only test that is of any value.

It is difficult to make adequate tests under those conditions, and I am fully conscious that the work we did was not as complete and as satisfactory as it might have been; but we did at least give both types of apparatus a fair trial, and both Warren and I were, if anything, prejudiced in favour of the closed apparatus. Warren has told you what happened when he tried the closed type above the North Col when he was first there. I had not seen him when I got out on the Col with Tilman, Smythe, and Shipton later on, but I heard what happened, and when the opportunity came of going up to Camp 5 I tried the open type first and got surprisingly satisfactory results with it more or less from the word " Go." I found no difficulty in acquiring the breathing technique that it demands, and though it did not send me uphill at the speed one might have climbed at in the Alps, it did at least improve my performance as compared with the previous day coming up to the Col. In particular, I noticed a tremendous sense of ease in climbing, in that it took away the great strain that one is apt to feel otherwise. The following day when I made the short test on the closed apparatus I obtained entirely unsatisfactory results, exactly comparable with what Warren had experienced.

The comparison of these two alternative units is a technical matter which I need not bore you with here, but I would submit that the agreed success of the open type of apparatus and its inherent simplicity, which is an enormous advantage under those conditions, and one which those who have never been there cannot appreciate, are very important arguments in favour of it.

If oxygen is to be used successfully on Everest, the design of the apparatus will have to be improved as far as possible—and there is still room for improvement, because the bulk of the weight one carries is not oxygen at all, but metal. Everything possible will have to be done in advance to develop and practise the technique. It is no good taking oxygen as a last resort in case the attempt without it fails.

In appreciation of Tilman's leadership I would like to say that if ever I go to Everest again I very much hope it will be under his leadership.

Mr. N. E. ODELL: During the course of an expedition one sometimes falls to wondering what sort of a report will be demanded on one's return home. Lying in my sleeping-bag at Camp 1 towards the end of the expedition I composed a speech befitting, as I thought, such an occasion as this. That particular one was

largely forgotten, and I found myself composing another walking in the drenching monsoon rain down the Lachen valley on the way back to Kalimpong. A good deal of the speech so composed was severely critical, for I felt that there was so much that was not as it should be in the running of these Everest expeditions. A swing-over from the large, expensive expedition to the smaller, economical one had by no means been all to the good. True the compacter, smaller party had been a success as a party, and much of our equipment had been reasonably sufficient, but in other respects the cult for lightness and mobility had been carried unnecessarily far. It should be quite evident that the Everest expeditions are, by reason of the position of the mountain and its approach, in quite a different category from those smaller summer undertakings on the southern slopes of other Himalayan peaks. An Everest expedition operates for anything up to six months, from a period of real winter in Tibet to relatively genial summer conditions. Therefore the extreme cutting down of spare clothing and other articles of equipment, as practised on this year's expedition, is not only undesirable but highly risky. I have myself travelled too far in the Arctic and elsewhere not to appreciate what the fortuitous loss of an important garment, for instance, may mean. At the same time in other respects improvisation is often a desirable necessity, but even that has its limits.

But it is mainly in respect of the provisioning that I would criticize this year's expedition. Frankly we did what we did on the mountain not because of our meagre rationing but in spite of it. And we could have done more at times than we did, and returned, some of us, in better condition, if our rationing had been ampler and more suitable. I am no believer in the necessity for truffled quails or champagne (though practically all of us regretted the refusal of a generous gift of a case of the latter), but for a sustained sojourn at really high altitudes a carefully selected and varied diet is essential; and some alcohol has its uses after a particularly exhausting day. As most people know, one's palate and appetite become very fickle at high altitudes, and it is no good thinking that badly cooked porridge, or an inferior brand of pemmican, or a single rasher of bacon for breakfast, is going to keep together the body and soul of even the most devoted Everest climber. Valuable advice in this respect can and should be expected from the medical officer. Moreover, the Shipton-Tilman doctrine of living off the country is definitely inapplicable to, and highly undesirable to try to practise in, Tibet. For one thing, local supplies of food are non-existent or hard to come by, and where purchase is possible from the peasants there is inevitable shortage and likely famine during the succeeding winter. It seems often to be forgotten that one of the great objections of the Lhasa authorities to these expeditions is their tendency to upset the internal economy of the country.

Nor am I at all satisfied that dispensing with a transport officer, as we did this year, has as much advantage as disadvantage. He can become an actual member of the climbing party if necessary, when his duties of transport to the foot of the mountain are completed, as several earlier expeditions have arranged. Certainly the rôle of interpreter and transport officer should be kept distinct, as was not done this year.

Briefly, in my opinion a future expedition to Mount Everest will be best advised to adopt a compromise between the lavishness of some earlier expeditions and the frugality of this year's enterprise. I still consider that the conduct of the expedition of 1924 was a model for all time, for if the cost of the unsatisfactory oxygen equipment of that year be deducted the total expenditure was by no means excessive.

I was more than glad of the opportunity of continuing my geological observa-

tions which were commenced in 1924 and furthered by Wager in 1933. This work was always carried out as heretofore with strict regard to the susceptibilities of the Tibetans, and most of it was purely observational. As to the stratigraphy of the Everest Series and its actual age, in 1924 I indicated the possibility of its being a southern outlier of Heron's Permo-Trias Series, which outcrops along the southern border of the Tibetan plateau proper. Without further question Wager adopted this suggestion, and from fossil evidence and relationships in northern Sikkim added the very plausible one that the Everest Limestone Series might be considered Permo-Carboniferous or Carboniferous, and not Permo-Trias, in age. If his distant correlation is valid, then by actual local field correlation I was able to determine that the age of the Everest Series is definitely not younger than Permo-Carboniferous. Moreover from those superb view-points of the Lhakpa La and the Rapiu La fresh evidence was obtained as to the actual structure of the Everest and Makalu massif. From Makalu a great thrust-plane runs beneath Lhotse and into Everest itself. In consequence of movement along this thrust-plane the Everest block has been tilted, and the rocks of the mountain given their well-known, and, from the climbers' point of view, unfortunate, northerly dip. Moreover it could be seen that the top of Makalu is composed of a portion of a great sill of light granite whose injection probably accompanied the above movement.

Amongst glaciological observations one's earlier surmises were confirmed, and the Mount Everest glaciers found to be frozen throughout their mass and to have other High Polar characteristics. The Ahlmann glacier-drill was brought into use, but owing to the extreme hardness of the ice little headway could be made with the drilling bits available. The structure of the trough of the East Rongbuk glacier was re-examined, and while my ideas of 1924, as to its being a special zone of compression and shear, were confirmed, it would appear that the blue banding of the ice, then attributed to foliation, is in reality largely due to the intersection of upturned bedding planes of coalescing tributary ice-streams. This intersection, together with the contained moraine and its heat-absorbing qualities, appear to be the main factors in the formation of the East Rongbuk trough, as well probably as in other similar features.

I regretted not being allowed to return *via* the Kharta valley, for I was particularly anxious to measure some of the remarkable river-terraces of the Chib-lung Chu, as suggested by L. R. Wager after his visit in 1933, for that might have tested the idea that the Himalaya may hereabouts have been upwarped since Pleistocene times.

Some meteorological observations were made, particularly determinations of relative humidity with an Assmann psychrometer, kindly lent by the Meteorological Office of the Air Ministry. We had hoped to use a special high-speed anemometer and so obtain for the first time measures of the wind velocity across the face of Everest. But the early arrival of the monsoon, before we had actually reached the North Col, prevented this being done.

I wish here to acknowledge my gratitude for other instruments lent me by the Society for use on the expedition.

The amount of research which can with profit be pursued by members of a Mount Everest expedition should quite eliminate the danger of bed-sores, which one of our party this year claims to be the chief menace of such expeditions.

[*This contribution is expanded from the report of what was said at the Meeting.—Ed., G.J.*]

The DEPUTY PRESIDENT: I feel we should have the opinion of members of previous expeditions. I will first ask Dr. Raymond Greene to add a word or two.

Dr. RAYMOND GREENE: Most of the remarks I could have made have already

been made by previous speakers, but there are one or two points I would like to underline.

First, the question of diet. In spite of what Mr. Shipton has said, it is clear that actually there was more minor illness in the 1938 expedition than in the 1933, of which I was a member. I think part of that increase in illness may well be due to the fact that in 1933 we consulted a dietician, and although the food we took was not palatable it was an adequate, well-balanced diet containing the necessary accessory food factors and necessary proportions of the essential food factors. I am quite certain that if Everest expeditions are to remain as fit as possible in the hard conditions in which they live, it is essential that the food should be very carefully considered.

I should like to say as to oxygen that I entirely agree with Mr. Tilman that the business of getting up Everest will not be finally settled until somebody has got up without oxygen, and the sooner somebody gets up without oxygen and allows the climbers to go back to climbing for pleasure, the better. Because I have made a special study of oxygen and oxygen apparatus it has fallen to my lot to do a certain amount of work on the subject. Prior to the setting out of the expedition I was asked by the Mount Everest Committee to undertake a certain number of inquiries into the matter of oxygen apparatus. These inquiries were begun months before the expedition started but, as usual, owing to obstructions here and there, the oxygen apparatus, as finally taken, was not properly tested before it went. The reason why the closed circuit apparatus did not work was that it was not quite good enough. If one could design a perfect closed circuit apparatus there is no doubt whatever that climbers could walk up the last part of Everest as easily as they could at sea-level. I have always been in favour of the open type of apparatus, and the one taken in 1938 differed only in minor details from that which I designed for the 1933 Everest expedition. I am not at all surprised, and certainly very pleased, to hear it gave more satisfaction than the closed apparatus.

Lastly I want to support with all the force at my command what Mr. Odell has said as to the scientific aspect of Everest. I think a lot too much has been said in the past about the spiritual and mystical significance of climbing Everest and about its possible effects on British prestige. However true that may be, the fact remains that we go to Everest not for those reasons at all, but either simply because it is fun or in order to satisfy some purely personal and selfish psychological urge.

I do not think we are any longer justified in spending large sums of public money in satisfying these private urges. If it is argued against me that the last expedition did not spend public money and that there is no reason why public money should be spent, my answer is that I do not think even private expeditions are justified in losing the outstanding opportunities which they have for making valuable scientific researches. Not only is it interesting and useful to carry out researches such as those suggested by Mr. Odell, but in an age which is becoming increasingly air-minded opportunities should be taken of investigating much more carefully than has hitherto been done the physiology of high altitudes and also the meteorology of the upper atmosphere. I think that future expeditions to Mount Everest should be planned primarily on a scientific basis. I am sure that the necessary funds would be available. The expedition should go out primarily as a scientific expedition accompanied by a small climbing party which, if opportunity arises, will undoubtedly reach the top.

Supposing we go on sending out expeditions which return one after the other but get no nearer the summit than the last, and possibly not quite so far towards

the summit, people will get rather tired of Everest expeditions and ask what is the interest of these continued failures. Everybody will know, of course, that they are gallant failures in the sense that no one could have done more than Tilman and his party did to reach the top, but the fact remains that one party after another fails to reach the top. How much more satisfactory it would be if they could come back and say: We did not get to the top, but at any rate we have important scientific achievements to our credit.

I think therefore that we should start straight away to plan a scientific expedition. I do not think we need fear particular opposition from the Tibetans. The scientist the Tibetans object to is a geologist, and there has been a geologist on almost every Mount Everest expedition. A scientific committee to plan the research on Everest should, I am sure, be formed now in order that if and when permission for another expedition comes, that expedition can go out to Everest as a scientific and not as a purely sporting expedition.

Mr. H. W. TILMAN: I am in entire agreement with Dr. Raymond Greene's suggestion with regard to the sending out of scientific expeditions, except that they should not be sent to Everest. There are plenty of other high mountains which are far more accessible, and in British territory, in which scientific expeditions could do all they want in the way of investigation.

As to Dr. Warren's suggestion that only the leader should go on to the glacier and get a sore throat, three out of seven of us this year had colds, sore throats, and coughs long before the glacier was reached, simply through the journey across the country leading to it. While I am open to correction, I think such complaints are far more likely to be the result of over-feeding than under-feeding. At any rate, it is, I believe, generally recognized now in England that coughs, colds, and sore throats are the result of too much to eat.

I must confess I was surprised to hear any criticism of the food, except from Odell, who has not yet finished criticizing the food we ate on Nanda Devi in 1936 and who, in spite of his semi-starved condition, succeeded in getting to the top.

I am sure that Dr. Warren as well as Dr. Raymond Greene will be interested to hear that we consulted a dietician in 1935, and though Raymond Greene was not there Warren was, and he will bear me out that the food we then had was much more Spartan than that which we had on the 1938 Everest expedition. As you know, dieticians have little sympathy with human nature. No two people agree about food, not even husband and wife. But the whole art of travel is to adapt oneself to circumstances. The Everest expedition involves more travelling than actual climbing and, as you have already heard, the difficulty on the mountain is that one does not want to eat any food whatever. In the opinion of at least two of those on the mountain we lived like Sybarites, but I am aware that there are degrees of sybaritism, if one may use the word. Up at Camp 3 we certainly lived very well; above that the choice of food is not particularly vital because of the fact that one does not want to eat at all.

I have already told you what we had to eat, and we found at Rongbuk at least forty boxes of 1936 stores, which some of the party were pleased to see. They contained nutritious things like pickles and liver extracts. I remember as we were about to leave Gangtok the Maharajah gave us a farewell dinner, and very excellent it was. Noticing how wistfully my comrades were regarding the last course of the five-course dinner and having to make a speech in reply to the Maharajah, I suggested that they had all the appearance of men who had undergone a long fast, or were about to undergo one. And I ventured to remind them of a saying by Thoreau, the great apostle of the simple life who lived alone in the American woods and wrote a book about it, that most of the luxuries and

nearly all the so-called comforts of life are not only not indispensable but positively a hindrance to the elevation of mankind.

Dr. T. G. LONGSTAFF: In moving a vote of thanks to the lecturer this evening I should like, first, to say how much I sympathize with Mr. Tilman's views. The large expedition whose objective has been mountaineering has never had any real success in the Himalaya. All the successful Himalayan ascents have been made by comparatively small parties such as Shipton, Tilman, and Smythe are celebrated for. Lord Conway's pioneer expedition was also a small one.

The idea of sending a scientific expedition to Everest is really deplorable; there could be no worse mixture of objectives. It is a district in which all forms of scientific investigation are particularly abhorrent to the Tibetans. If it is desired to send scientific expeditions to deal with terrestrial magnetism and that sort of thing, follow the lead of De Filippi, our lamented member who died a few weeks ago, or Dainelli, or Stoliczka, or any of the eminent scientists who have worked in the Himalaya, and choose a region suitable for the particular work required. Another point to remember is that on Everest expeditions there have always been scientific members. The reason that little really effective work is done by scientists on these expeditions is either due to failure of the individual scientist or to the accuracy of my statement that an Everest expedition cannot properly combine climbing and science.

With regard to oxygen I should like to see it more frankly admitted that little advance has been made on Professor Finch's achievement with Geoffrey Bruce in 1922. He used a similar apparatus to that employed—on his recommendation—this year. If since that date collaboration with Messrs. Siebe Gorman, the great oxygen experts, had been continuous, instead of invariably spasmodic and at the last moment, a type of apparatus suitable for mountaineers might by now have been evolved. Dr. Warren deserves great credit for breaking down custom and trying out apparatus in the Alps last summer.

So, in moving a vote of thanks to Mr. Tilman, I say that I think he has proved that a small party has as good a chance as any other of climbing Everest. He did not make it clear that he took two climbing parties of two men to 27,000 feet in the monsoon, in powder snow, and got everybody away without frostbite. A very fine performance indeed, really as fine a performance as that of Houston's party on K^2 this year, though that was at a lower altitude.

I beg to offer our thanks to Mr. Tilman for the account which he has given of the 1938 Everest expedition.

The DEPUTY PRESIDENT: We have had an extremely interesting evening, and it only remains for me to ask you to accord the lecturer and those who have discussed his paper a most hearty vote of thanks.

MEMORANDUM ON THE GEOGRAPHICAL FACTORS RELEVANT TO THE LOCATION OF INDUSTRY

Prepared by a Committee of the Royal Geographical Society at the request of the Royal Commission on the Geographical Distribution of the Industrial Population

I. ENGLAND AND WALES

THE evidence offered by the Royal Geographical Society does not attempt to formulate a theory of the location of industry. It is the case however that, among the numerous questions which the industrialist must ask when seeking a site for his enterprise, many relate to natural or geographical factors which are essentially within the sphere of study of this Society and which geographers are accustomed to handle and collate. Among purely physical factors, for example, may be mentioned space for horizontal expansion, type of soil and subsoil, liability to fog or flood; among factors resulting from man's activities examples are the general lay-out of lines of transport, the existing use of the land surface, distance from docks and markets, and so forth. Assuming a body charged with the task of advising the industrialist, or going further and assuming a body charged with the task of replanning industry on national lines, in what form could the relevant information most suitably be placed at the disposal of that body? Such was the standpoint from which the Committee appointed by the Council of the Royal Geographical Society considered the request of the Royal Commission for a Memorandum upon geographical factors relevant to the distribution of industry and of the industrial population.

2. The decision was reached that since geographical information is most effectively conveyed in the form of maps, a series of maps on a uniform scale should be prepared and laid before the Commission, the written Memorandum being an explanation of, and commentary upon, these maps. In a large number of continental countries in which the planning of industry (and its rapid development on new lines) has been a conspicuous feature (notably in Germany, France, Russia, Poland, Czechoslovakia, Finland, as well as in the United States) the State has undertaken the publication of a comprehensive official national Atlas, embodying a survey of the country in all its physical or natural aspects, side by side with a survey of the present distribution and utilization of its resources, the density and changes in the distribution of the population, and kindred matters of national interest and importance. Such an atlas, representing essentially a complete national stock-taking, has abroad been considered the indispensable preliminary to nation planning. No such atlas exists in Britain, and to that extent planners here must work in the dark, with but limited knowledge of present conditions. In particular, where, as in well-known instances, detailed surveys and plans have been made for special localities, data are wanting for the review of such plans against the background of the conditions and needs of the country as a whole.

3. This Society believes that the production of such an Atlas of Great Britain and Northern Ireland would be in the national interest, and regards

the maps which accompany this memorandum as the nucleus, but no more than the nucleus, of the series deemed desirable. In the original manuscript form in which they are now presented, the maps cannot be fully effective. They require redrawing with more precision by a professional draughtsman, when they would be in a suitable form for reproduction and publication. Facilities for the work necessary exist in the drawing office of the Ordnance Survey, but this Society could not charge itself with the expense of redrawing maps prepared in the interests of a Government Commission. Should funds become available, the advice of the Director-General of the Ordnance Survey is that each distribution should be reproduced in outline only on a stout transparent medium, when individual maps could be superimposed upon a political or physical base-map, or over-printed on such a base-map as convenience dictated. The device of the transparency allows of the immediate comparison of the maps by superimposition, when any relations existing between the various distributions are immediately apparent. It also allows of the use of "sieve" method of inquiry described in paragraph 29 below.

4. The list of maps for England and Wales is as follows:

1. * Distribution of the industrial (factory and workshop) population. (Census of 1931.)
2. Distribution of areas unsuitable for industry in respect of surface relief.
3. Distribution of limestones and quarries (printed).
4. Distribution of iron-ores (printed).
5. Distribution of coal-fields (printed).
6. * Actual location of coal-mines.
7. * Actual location of the iron and steel industry.
8. Distribution of water supply, distinguished as hard and soft.
9. Distribution of annual rainfall.
10. Distribution of low temperature (January nights).
11. * Distribution of fog.
12. * Distribution of overcast skies and daylight in December.
13. * Distribution of sunshine.
14. Incidence of snow on the main roads.
15. Agricultural land use and built-up areas.
16. Dominant regional interests: the Welsh line.
17. * Densely peopled areas (Urban and dense rural).
18. * Accessibility to railways.
19–25. Two-way accessibility by rail (i) London.
(ii) Leeds.
(iii) Liverpool.
(iv) Newcastle.
(v) Manchester.
(vi) Birmingham.
(vii) Edinburgh.
26. * Distribution of Class A and National Roads with reference to surface relief.
27. Areas not immediately suited to industry as eliminated by the sieve method.

28. Distribution of the industrial (factory) population by categories. (Census of 1931.)
29. Distribution of unemployment (Census of 1931) in all occupations.
30. * Distribution of persons employed in Metal Industries (Category VI, 1931).
31–41. * Percentage distribution of persons employed in Metal Industries. (Sub-categories 1–10.)
42. Percentage distribution of persons employed in Textile Industries (Category VII, 1931.)
43–49. Percentage distribution of persons employed in Textile Industries. (Sub-categories 1–7.)

An asterisk indicates that the map has also been prepared for Scotland. A complete list of the Scottish maps will be found in Part II of this Memorandum.

5. The scale of 1/M (one to a million) was chosen for these maps, since on this scale the separate maps of England and Wales and Scotland are of convenient size for handling, and since the Ordnance Survey has already produced some important maps on this scale, notably a general map of Relief and Drainage, a Population Map, and the maps listed above as 3, 4, and 5. It should be emphasized however that maps on this relatively small scale can provide only general and not detailed information. What is claimed for them is that they afford direct pointers to areas geographically suited to industry, and form a suitable starting point for more detailed inquiries. Large-scale maps and surveys on similar lines have been prepared for particular localities under the auspices of the Geographical Association. These could be exhibited or others prepared if desired.

6. The geographical factors relevant to the location of industry are of two kinds, (*a*) those strictly physical, as for example surface configuration, location of minerals and existence of underground water supplies; and (*b*) those due in whole or part to human agency, as for example the distribution of the railway network, of docks and canals. The physical factors may be further subdivided according as they are or are not susceptible of modification by human agency. Location of minerals, and surface elevation are examples of unalterable physical factors that must always control planning, while liability to flood and incidence of fog are examples of factors which at any rate theoretically can themselves be brought under partial or complete control.

7. Before considering the physical maps, it is useful to examine the existing pattern of distribution of the industrial population of England and Wales. (Map 1.) On the assumption that broadly speaking only the manufacturing industries are capable of being located at the will of the industrialist or the planner, the map was prepared to show the number and distribution of persons engaged in such industries according to the Census of Occupations taken in 1931.[1] It thus excludes persons engaged in the fishing, agricultural, and

[1] Categories V–XVII, XX, XXI.

extractive (mining) industries, all those engaged in the building trade, and all those in the various "services" including public works. While the figures in possession of the Ministry of Labour would no doubt permit of this map being brought up to date, the method by which these figures were grouped when presented as part of the evidence of the Ministry to the Royal Commission made strict comparison with the census figures impossible. All that can be safely said is that a further number of dot symbols (representing one thousand workers) should be added at Luton, Slough, and round the north-western sector of Greater London, as also to Birmingham, Coventry, Corby, and other new centres of industry, while the number of dots should be reduced in the areas specializing in textiles, most notably in East Lancashire (*e.g.* Blackburn) and in a less degree in West Yorkshire (*e.g.* Bradford). Even were these changes carried out however they would make little fundamental alteration in the general pattern of distribution brought out by the map. The major pools of skilled and semi-skilled labour are to be found within an axial belt covering approximately 14,500 square miles, or 39 per cent. of the total area of England and Wales, which runs from Greater London in the south-east to South Lancashire and the West Riding in the north-west. Outside this belt there is a small general scatter in the county and market towns (where however a relatively small expansion of industry would obviously lead to competition for labour[1]) and there are secondary concentrations isolated alike from the axial belt and from one another, notably the Northumberland and Durham coalfield region, the West Cumberland region and the South Wales region—in fact the Special Areas.

8. A companion map (Map 28) prepared from the Tables in the Census of Industries shows the distribution of factory workers grouped into the broad categories utilized by the Registrar-General in making his returns; namely, Manufacture of bricks, pottery, and glass; Manufacture of chemicals, dyes, paints, etc.; Manufacture of metals; Manufacture of textiles; Preparation and manufacture of skins and leather; Manufacture of clothing; Manufacture of food, drink, and tobacco; Manufacture of wood, etc.; Paper-making, manufacture of stationery, etc.; Manufacture of other goods. (These categories differ from those employed in the Return of Occupations.) While these categories, embracing in a single group watch-makers and makers of iron castings, are too coarse to point the industrialist to the particular labour supply he is seeking, the map allows of distinction between centres that are highly specialized in particular directions, and those that carry on a variety of industries. Clearly when a flexible and adaptable labour supply is being sought it is most likely to be found in a locality of the latter type, and it is significant that in Greater London every category and sub-category down to the smallest subdivision is represented. It would be a simple matter to map the sub-categories in a similar style, and to any one who has actually handled the Census Tables the superior usefulness of the map over the column of figures to the practical man needs no emphasis.

[1] The country towns set in areas of "dense rural" population are obviously better situated in this respect than those surrounded by thinly peopled districts, provided always that expansion is gradual.

9. The series of maps numbered 30–49 indicate very broadly the varying degree of concentration or decentralization which obtains in the different branches of the metal and textile industries respectively. The analysis has however proceeded no farther than the separation of the figures according to percentages on a county basis. The percentage figure is inserted on the map in the approximate location of the majority of workers in the category or sub-category under consideration. A comparison of maps 31–41 indicates in the first instance that, so far as the metal industries are concerned, the tendency to a high degree of concentration is not confined to the branches of smelting, mining, and founding in which it might be expected, or to shipbuilding where the limiting geographical factors are obvious, it extends also into such groups as the making of cutlery and machine tools, and the working in precious metals, jewellery, and plate. On the other hand, general engineering, electrical industries, and the construction and repair of vehicles show a much wider but by no means a general or an even distribution.

10. Pursuing this last point further it is instructive to compare the figures for a group of counties wholly or mainly within the axial belt referred to in par. 7, and a group of counties lying wholly without this belt:

The ten sub-categories are:

1. Smelting, converting, refining, and rolling of iron and steel.
2. Extracting and refining of other metals and alloys.
3. Founding and other secondary processes in metal working.
4. Engineering (not marine or electrical).
5. Electrical installations, cables and apparatus.
6. Construction and repair of vehicles.
7. Shipbuilding and repairing; marine engineering.
8. Cutlery and small tools (not machine tools).
9. Other metal industries (not precious metals, jewellery, or plate).
10. Precious metals, jewellery, plate.

Sub-category[1]	*Tot.*	1	2	3	4	5	6	7	8	9	10
Warwick ..	13	¼	7¼	14¼	6¼	12¼	23	—	14¼	18½	31¾
Lancashire..	12	7¾	19¾	8¼	17¾	17¼	8¼	14¾	2½	10	4¾
Yorkshire,W.	10½	32¾	2¾	9¾	11¼	3½	5	¾	53¼	8	20
London Adm. Cty.	8¾	¼	12¼	3½	10¼	16¾	7	2½	4	12	14
Stafford ..	8¼	9¼	6¼	15¼	3¼	4¼	6	—	5¾	19¼	3¼

In this first group there is some balance of employment in the sub-categories, in contrast with the second group:

Sub-category	*Tot.*	1	2	3	4	5	6	7	8	9	10
Cumberland	½	2¾	¼	¼	¼	—	¼	¼	—	¼	¼
Durham ..	3	6¼	4½	2½	3¼	¼	1	12½	¼	1¼	½
Northumberland ..	1¾	¼	2	¾	2	1	½	11¼	¼	¾	½
Hampshire	2	—	¼	½	1¼	2½	2¼	15¾	—	¼	1

[1] Figures are in percentages. The *Total* column gives the percentage of the total for England and Wales in all Sub-categories.

Here each county offers employment to any considerable extent in one or at the most two branches of metal-working.

11. In the case of the textile industries, the outstanding example of intense concentration is South Lancashire with over 80 per cent. of the workers in cotton textiles, and a correspondingly high concentration of unemployment and diminution of employment related to the contraction of the Indian and other overseas markets. Within this area, of course, a detailed analysis reveals great local contrasts, in part related to the fact that lost markets are mainly for the coarser materials. According to figures supplied by Mr. Wilfred Smith, the number of looms employed in Blackburn, Accrington, and Darwen in 1936 was only 57 per cent. of those employed in 1929. Elsewhere (*e.g.* Bolton) the reduction is of the order of under 20 per cent. Artificial silk affords a marked contrast to cotton in its tendency to decentralized location. Artificial silk is however alike a newer and a smaller industry than cotton, and is concentrated in the hands of a relatively small group of industrialists. Its basic raw material is produced by a chemical process, its historical connections are with natural silk, and its end products to a large extent associate it with the hosiery and knit goods industry, already established in the East Midlands. Where an exceptionally wide range of diverse factors demand consideration it appears probable that choice will fall upon a wide range of localities.

12. What has been termed the axial belt containing the major pools of skilled and semi-skilled labour is also a belt within which the population density map suggests that reserves of unused or unskilled labour will be found (Map 17). On this point further information can be obtained from the map indicative of dominant local interests (Map 16). A particular "tone" is given to a community where a significant proportion (here taken as 30 per cent. of occupied persons) is found in one particular group, whether it be mining, agriculture, factory work, service, or whatever it may be. That tone may become apparent in the political or social outlook of the community, or in the view-point of local government bodies, executives and administrators. From the point of view of labour supply, it is well known that a mining community, at least as regards its older members, does not readily adapt itself to factory work, but on the other hand in such a community there is likely to be unused female labour. In a residential or recreational seaside belt, too, unskilled female labour may be plentiful, but is likely to be attracted away from the factory in the height of the season. The map shows that, contrary to general belief, the million or so workers classified as in agricultural occupations still give to a preponderating *area* of the country its distinctive tone, and that, again contrary to general belief, the manufacturing and the mining communities are in the main distinct, and the latter are tending to shift into more rural areas as larger and larger mines are opened up in the "concealed" coalfields. The way in which, over so large an area round London, agricultural interest has fallen below the 30 per cent. limit, and yielded place to interest in the provision of residential amenities, is remarkable; and nowhere in the whole country is there so continuous a belt devoted to the residence of retired or "independent" persons and to recreation, as along

the South Coast. Here, of course, the "service" groups of occupations take a high place, and as a market for consumers' goods the area takes on an importance which is not due to numbers alone. An examination of such an area as the South Coast affords ample evidence of the need for more detailed investigation. Thus Portsmouth offers a contrast to such other urban agglomerations as Bournemouth, Brighton, or Eastbourne, and, from another angle, a contrast to Plymouth in spite of a common naval interest. The "Welsh line" (beyond which 40 per cent. or more of the population can speak Welsh) was added to this map, as from quite another standpoint it denotes a cleavage in outlook, habit, and interest, which the industrialist or planner must take into account.

13. The Land Use map (Map 15) is the very inadequate substitute for a map to show the relative fertility or productivity of different parts of the country which it is as yet impossible to prepare. Despite its importance, a soil survey of Britain has yet to be made, and all that was possible was to epitomize the information contained in the 'Oxford Agricultural Atlas,' and thus indicate the areas where fundamental foodstuffs—bread, milk, sugar, potatoes—are most intensively produced. The Land Utilization Survey of Britain has been collecting relevant data for eight years, much of which is now available in manuscript form. A provisional first attempt at a "land fertility map of Britain" will, it is understood, form an essential part of the evidence offered by the Survey to the Royal Commission.

14. The principal arable belt is in the east, stretching southward from the East Riding of Yorkshire. Although it includes some exceptionally rich soils, the predominance of arable over grass is here related rather to low rainfall than to fertility. Extending less than a century ago as far as Hampshire, this belt of the traditional "corn counties" has been very seriously reduced by the growth, not only of Greater London, but of the much wider residential zone around it indicated on the previous map (Map 16). In South Essex, Middlesex, and North Kent, the belt included market-gardening, fruit orchard, and potato-growing areas now very rapidly vanishing. Somewhat similar areas of exceptional importance devoted to dairying and potato growing (often with associated pigs) are seen to be situated in close proximity to certain industrial centres in Lancashire, Cheshire, and the Midlands. These areas are endangered by the zoning for industry and for semi-rural residence of the belts which form the peripheries of the great conurbations. The areas already completely built up, which may be estimated at two million acres, carrying a population of twenty millions, are shown on this map in solid black, together with the areas (shaded grey) normally too elevated for the plough. The latter provide rough grazing, or serve as catchment areas for large-scale water supply. It is from the lowlands that thousands of acres are being abstracted yearly for suburban settlement. According to the latest published figures, the loss of cultivated land between 1936 and 1937 was 83,000 acres for England and Wales. Of this total 9000 acres had fallen back into the category of rough grazing, leaving 72,000 acres, or 0·3 per cent. of the total area, as completely withdrawn from the categories of land coming

under the purview of the Board of Agriculture. A point often entirely overlooked is the very limited area of Britain having soils suitable for intensive agriculture of the market-gardening type. Probably not more than 5 per cent. of the surface is so usable, yet this is the very land most likely to be taken over for industry or for housing development. It is level or lightly undulating, well drained and easily worked—qualities which fit it alike for agriculture and for urban development. Land of this type is a precious heritage which needs protection from industrial usage and from building.

15. Elevation, steep gradients, and a surface broken up into constricted valleys impose severe restrictions on the location of manufacturing industry (Map 2), and these considerations are more important than formerly owing to the general horizontal lay-out of modern factory premises. As a consequence many parts of older industrial regions (*e.g.* those in the Pennine valleys) are unsuited to modern industrial requirements. Areas unsuitable in these respects comprise about a tenth of England and a third of Wales. Such areas of upland or broken relief carry a very scanty population, and hence provide neither labour nor markets; furthermore they act as barrier belts in a two-fold sense: lines of transport, whether by road or rail can rarely cross them by direct routes, and in the absence of local traffic such lines of transport are expensive to run and likely to be poorly developed. The positions of West Wales and of West Cumberland are peculiarly unfortunate in this respect, while the greatest negative and barrier belt of all, the Southern Uplands and Cheviots, intervenes between industrial and metropolitan England and industrial Scotland. That this is a geographical factor which helps to explain the reluctance of light "consumers" industries to go to Scotland can hardly be doubted.

16. Mining and quarrying are industries which do not respect gradient or elevation, and may therefore be found actually within the poorly accessible or barrier belts described in the previous paragraph. Since in the long run all such extractive industries are ephemeral, owing to the exhaustion of the mineral sought, they are likely to leave behind unemployed populations in localities unsuitable for other purposes. The case of the northern rim of the South Wales coal basin (although here cessation of demand rather than exhaustion of supply has occurred) is a familiar and painful example, and in general the older, shallower, and largely exhausted sections of each of our major coalfields exhibit the same features.

17. Not only mines and quarries, but certain basic industries, notably iron and steel, heavy chemicals, and the making of bricks, tiles, and cement, are tied to the location of their raw materials, and hence, within the limits imposed by the latter, produce fixed elements in the pattern of the industrial population which the planner must respect. A map (Map 6) showing the actual location of large and small coal mines, and another of the iron and steel industry (Map 7) have been prepared, for use in conjunction with the maps detailing the occurrence of limestones, iron ores, and coal measures published for the Geological Survey (Maps 3, 4, 5). The association of low-grade iron-ores (relatively expensive therefore to transport) with the outcrop of Jurassic

rocks has brought the heavy iron and steel industries eastwards into rural Northamptonshire and Lincolnshire, as at an earlier date to Teeside, in each case at a distance from the coalfields, and in the more recent cases remote from tide-water. Millom, in the south-west extremity of Cumberland, and Furness in the extreme north-east of Lancashire exemplify the power of iron-ore deposits to attract industry to relatively inaccessible points.

18. The map of the limestones has a further importance in relation to the abundance, quality, and geographical distribution of water supply. A general indication of the areas with hard and soft water respectively is given by Map 8, since for certain industries soft water is essential, and for others hard water adds to the cost of production. In detail, the chemistry of the natural waters of Britain is subject to a complex variation which defies simple cartographic treatment. It is possible however to devise a broad regional division into "water areas," having regard to the known requirements of large-scale industry. All the textile and dyeing industries require soft water. On the other hand the brewing and papermaking industries require hard water for process, though soft water for use in boilers is always needed for steam plants. In many regions it is possible to get both hard and soft water in depth from different geological formations. Thus Thames-side paper mills obtain hard water (for process) from the Chalk and soft water (for boilers) from the Lower Greensand at greater depth. The map effects a broad threefold grouping of the several areas of the country according as the outcrop geology gives rise to dominantly hard water conditions, soft water conditions, or mixed or intermediate conditions. Thus all the chalk and limestone areas fall into the first class, various areas of Palaeozoic and Tertiary sediments into the second, while large tracts of the West country, the Midlands and Northern England must be grouped in the intermediate category, since areas of calcareous rocks intermingle on a small scale with "soft water outcrops." In these areas it may be presumed that both hard and soft waters are obtainable, but in general waters of a moderate degree of softness predominate. The London and Hampshire Basins fall in reality into a special category since their surface waters are soft, and their underground waters (from the Chalk) are hard. It should be noted that river waters in these regions are not available on a large scale for industrial use; in general hard sub-surface waters alone could be counted on by new industrial establishments.

19. The amount and reliability of rainfall (Map 9), and the incidence of drought are points of importance so far as particular industries (*e.g.* paper making) using a great volume of water are concerned. The relation between rainfall on the one hand and the changing volume of flow (regime) of streams and rivers on the other is however not a simple one, and observational data are at present very deficient. There is a similar lack of precise information as to the incidence and frequency of flooding, although areas liable to flood because of their configuration and position can be recognized and mapped. It is to be hoped that the present state of knowledge will be vastly improved in the near future as a result of the work of the recently formed Catchment Boards and of the Commission now considering the whole question.

20. Statistical data as to atmospheric humidity are available for most parts of the country, and bear a relation to the incidence of fog. Fog is conditioned also by surface configuration and hence is patchy in occurrence, while as is well known solid smoke and dust particles in the atmosphere alike induce fog formation, and render the fog opaque. The fog map (Map 11) repays study, the losses and delays due to fog being too familiar to need mention here. The map of overcast skies in mid-winter (Map 12) indicating also the earlier times of sunset in the north, is important where good natural lighting is a consideration.

21. The map showing the distribution of hours of sunshine (Map 13) is of practical use for the same standpoint, namely good lighting, and also from the standpoint of health and general amenity, the advantage generally lying with the south and east. Snowfall is chiefly important in so far as it affects transport and will be considered in that connection. Low temperatures are by no means of uniform incidence (Map 10) and corresponding contrasts in the cost of heating may be expected.

22. Despite the expansion of road transport, railways remain indispensable, and the first of the series of accessibility maps shows proximity (under 4 miles) to railway stations, and hence to goods yards and company's sidings (Map 18). It indicates that such facilities are by no means uniformly distributed, and that the axial industrial belt already pointed out is nearly everywhere well placed in this respect. Since the tendency is to reduce rather than to expand the railway network in the thinly peopled and poorly accessible areas owing to road competition, this map has more than an ephemeral importance.

23. The next set of maps started from the assumption that if industry was compulsorily or by persuasion decentralized, there would still be the necessity to keep in close touch with some populous centre, where such business as banking, insurance, marketing, is transacted and where headquarters organizations of large concerns must necessarily still be located. Business visits both to and from such a centre must always be essential, and areas were delimited around each of the great cities, not in accordance with the fastest train of the day, but on the basis of train connections both to and from the centre giving ample time (from either end) for holding a business conference in business hours and returning the same day. A secondary zone was distinguished in which an early start or very late return made the day unduly long, while in the third zone one night away from home, in the fourth zone two nights afforded the criteria (Maps 19–25).

24. The resulting maps bring out very plainly that accessibility bears little relation to distance, while poor accessibility seems to bear a very distinct relation to the present state of depression shown by the Special Areas. The specialized textile towns in the valleys both east and west of the South Pennines are poorly accessible from London, as is the greater part of Wales. Leeds, which can advertise itself as "prosperous," is excellently placed in respect to a great part of the industrial north, while Liverpool's position,

like that of Newcastle, is relatively poor. Manchester presents a somewhat similar picture to Leeds. Swansea is so deficient in nodality as to afford no comparable map, while on the other hand the belt with first-class accessibility to and from Birmingham was found to be almost exactly coincident with the axial belt frequently referred to. It is of course the case that accessibility in the sense here employed is what may be termed a "cyclic" factor: it promotes, and in turn is improved on account of, industrial activity.

25. The movements of scheduled goods trains to and from the same centres could be similarly mapped. Such maps indicate that even were flat rates introduced for the transport of goods as has been done for the transport of mails, the nodal points would still reap the substantial competitive advantage of time saving, which is not susceptible of costing. Their nodality, going back in many cases to mediaeval and even to Roman times, is fundamentally of geographical origin, and has in course of time led to the establishment of the nexus of routes appearing on the map to-day.

26. Accessibility by road is more difficult to define in terms of time or cost. The map (Map 26) shows the pattern of "A" roads among which "national" roads (not in all cases actually in existence) are distinguished. The upland belts which have considerably affected the pattern are also shown on the map, and among the points thus brought out is the geographical accident of the gaps through the Pennines which contribute to the superior nodality and accessibility of Leeds. An attempt has been made (Map 14) to indicate the duration of snow cover on the many important roads which are forced to cross the Pennines, the Welsh mountains, or the Southern Uplands. While the evidence is conflicting, and although rail traffic is rarely completely interrupted by snow, there are areas where heavy lorry traffic is still seriously affected and the same is even more true for the business man's small car, so that the point is of real importance in considering relative accessibility. Further details are furnished in an Appendix (p. 522).

27. So far as the general road pattern is concerned, the axial belt is again prominent, while transverse routes between west and east are very poorly developed. London interposes, perhaps fortunately, a barrier between south-eastern England (Kent, Surrey, and Sussex) and the Midlands which it becomes increasingly difficult to negotiate, for the crossing by car of London proper takes a minimum of an hour in any direction. This barrier is continued eastwards by the Thames estuary, while the estuarine barriers of the Humber and Severn, and to a less extent that of Morecambe Bay, play their part in lessening the accessibility, and hence, it must be believed, the prosperity of the areas behind them.

28. It is, of course, no mere accident that at either end of the axial belt of maximum concentration of the manufacturing population lie the two outstanding points of entry and exit of the country's external trade, namely the Port of London and the two closely linked ports on the Mersey estuary and Ship Canal, Liverpool–Manchester. It is often stated that all parts of

England and Wales have easy access to the sea, but this fact though true is devoid of significance so far as location of industry is concerned. Two-thirds of the country's imports and exports (measured in value) enter or leave by the Thames or by the Mersey. Southampton and Hull, too, exist mainly to serve the axial belt, although separated from it by 40 or 50 miles of non-industrial farming country. Their much smaller trade totals bring up to three-fourths of the whole the proportion of the external trade of England and Wales that is closely related to this belt. Access to overseas markets and sources of raw material must be thought of mainly in relation to these four shipping points.

29. The last map requiring comment (Map 27) affords an indication of one method by which the whole series may be used. It is constructed on what may be termed the "sieve" method. One by one features which render areas not immediately suitable for industry are marked off in black on the same outline map: in this case areas unsuitable because of their surface relief, areas at present unsuitable because of their scanty population, and areas at present unsuitable because of their poor accessibility from any nodal city, are sifted out. It does not of course follow that the residual white area which has passed through these sieves is everywhere suited to the controlled or compulsory location of industry. Areas devoted to residential and recreational purposes, and areas where industrial expansion would encroach on agricultural land of exceptional importance, together with areas scheduled for military or air-craft use, should also be sieved out; but working on the 1/M scale such finer discrimination is impossible, and can more conveniently be carried out when a particular region is under discussion. Even without this finer sifting, it is remarkable how extensive is the area to which industry could not wisely be transferred without a migration of population (involving provision of housing, schools, and social services generally) or an improvement of access, or both. In South Wales on the other hand it can be seen that the Vale of Glamorgan is prominent as a "positive" area, but the narrow thronged valleys near the northern rim of the coal basin are sieved out by their surface configuration as well as by their poor accessibility. Our older mining areas, perhaps above all others, present the most difficult problems to the planner. In the north-east, the Newcastle and Tyneside area may be noticed as positive.

30. In conclusion some general observations are perhaps permissible. It is common ground that under the influence of a complex of historical and physical factors, the pattern of English industrial development began to take shape nearly a century and a half ago, and that a policy of free trade and *laissez faire* led to the sharpening and deepening of the outlines of that pattern until it came to be looked upon as stereotyped and final. One of its elements was the concentration on localities suited to supply countries overseas; another was the concentration on the coal-fields. It is common ground also that changes during the last twenty years, none of them strictly geographical, have accelerated the tendencies which still earlier had commenced to render that pattern in some measure obsolete. The distribution of industry now no longer fits the distribution of the industrial population, and we have "dis-

tressed areas" and lop-sided urban growth. Putting the situation into geographical terms, we can say that, with the growth of industrial activity overseas accentuated by economic nationalism, marginal or sea-board location has lost a considerable measure of its old importance. Hence areas that relied mainly on such a location for their prosperity are now distressed. This loss is in part balanced by the increased value of interior location, but only in so far as that interior location is nodal. Nodality has always carried with it a tendency to diversity, as opposed to specialization, in industry, and it is obvious that the chances of a diversified industrial centre being adversely affected at every point by economic and political changes are relatively slight. Hence while a Blackburn and a Bradford suffer, a Manchester and a Leeds hold their own, for their nodality has lent them diversity of activities and functions. Even a Newcastle escapes the measure of distress that in certain parts of Tyneside and of the Durham mining area has become extreme, and such examples could be multiplied. Two further points may be noted. Many if not all of the new industries that have sprung up in the last twenty years have arisen strictly in relation to the home market or to overseas markets reached through London. Clearly they are most scientifically located at interior nodal points. Then again, one of the most striking features revealed by the new occupational statistics is the marked increase in the proportion of the population finding work in what may be termed the "services"—transport, public utilities, retail trade—as opposed to the manufacturing industries. Such services, and therefore such opportunities of employment, are also at a maximum at nodal points, of which, of course, London is the supreme example: like Manchester it is simultaneously an interior and a marginal (that is sea-port) centre. The second force at work blurring the old pattern, namely the escape from the coal-field location, or perhaps it is more true to say, from location on the inland coal-fields, cannot be analysed here. That the increasing use of electrical power, and the construction of the grid, have given a new freedom of location cannot be doubted, but data are lacking for a precise statement.

31. The fundamental question that has to be decided is whether industry is to be forced or cajoled back into the old distributional pattern, or whether the industrial population is to be assisted to adjust itself to a new one. With that problem however a Geographical Society has nothing to do. We are concerned rather to put the point that a series of national maps of the type which we have prepared and here put forward has a twofold value, in the first instance as presenting a clear picture of the geographical distribution of industry and the industrial population as it is to-day, and in the second instance as affording some guidance in respect of any future policy of planning.

II. SCOTLAND[1]

1. The physical characteristics of Scotland and the history of its economic development during the last two centuries both present many sharp contrasts to those of England or Wales and it is inevitable that the structure and distribution of Scottish industry should display highly individual characters

[1] Drafted for the Committee by Mr. David L. Linton, of Edinburgh University.

of their own. It has therefore been thought necessary to accord separate consideration to the industrial features of Scotland and related geographical factors and conditions, and these topics form the subject of the following paragraphs. They are based upon a series of maps specially compiled for the purpose, and in this connection the assistance of the Royal Scottish Geographical Society, of the Department of Geography, University of Edinburgh, of Mr. Ian Stone, Hamilton Academy, and of Mr. W. G. Bruce, Geological Survey of Scotland, must be gratefully acknowledged. Use has been made in these maps of material collected by the Scottish Development Council and published under the title 'Industries of Scotland,' by Mr. C. A. Oakley.

2. Throughout Scotland the duration of daylight from sunrise to sunset in mid-winter is less than the normal length of the industrial working day. In Central Scotland on perfectly clear days artificial lighting is thus required before 9 a.m. and after 3 p.m. This imposes a considerable handicap upon industry not shared by industrial districts farther south and not compensated by the long days of summer. The latter are of advantage to private individuals and to municipal authorities—*e.g.* Edinburgh Corporation dispenses with street lighting on minor roads and streets from late May until late July—but can only assist those industries whose operations include a night shift. Overcast skies and fog, of course, materially reduce the hours of effective daylight, particularly in winter, when artificial light may be required throughout the day. Cloudiness increases inland and especially over the high ground, the most favoured districts being the coasts of the extreme south-west and of the inner Moray Firth. Both are remote from the main centres of industrial activity, though the latter is in some ways a focal region for the north of Scotland, and it is noteworthy that neither area is remote from sources of hydro-electric power. Fog as defined by the meteorologist is largely a coastal phenomenon and is of significance chiefly in connection with the port entries of Clyde, Forth, and Tay. On the other hand "foggy days" in quantity are practically confined to the industrial area of the centre. In a large area between Clyde and Forth, containing roughly two-thirds of the industrial population of the country, one day in twelve is a foggy day, while at the mouth of the Clyde (the Tail o' the Bank area) the proportion rises to one in seven, and in the centre of Glasgow to one day in five (Maps 1, 2, and 3, pp. 521–2).

3. Scotland has a very considerable mileage of both roads and railways, especially when this mileage is considered relatively to the small numbers of the people. Thus there are in Scotland 5·5 miles of public highway for every thousand of the population, as compared with 3·8 miles only in England and Wales. On the other hand, when Scotland's equipment for transportation is considered in relation to the area of the country it is seen to be meagre, every 1000 square miles of territory showing only 880 miles of public road, as compared with a corresponding figure of 2640 miles for each 1000 square miles of territory for England and Wales. What is even more to the point is that the available mileage alike of roads and railways fails to offer a reasonably uniform network covering the whole country. Only Central Scotland pos-

sesses what may be regarded as an adequate system of communications and even this is deficient in certain important respects that will be set out below. Outside this central region there are only two small areas served in a comparable fashion by a network of roads and railways: namely, the lowland half of the county of Aberdeen and the lower half of the Tweed valley. Over the remaining and larger portion of the country the conditions of access are altogether of a lower order. The Southern Uplands and Cheviot regions and the central Highlands are only penetrated by a few trunk lines of road and rail ill-supplied with feeders or branches, while in the large region of the mainland north-west of the Caledonian Canal, comprising over 7000 square miles even this ceases to be true, for only its eastern fringe is tapped by trunk lines at all. Beyond this again lies the insular fringe, from Shetland to the islands of the Firth of Clyde, which depends entirely upon steamboat or air services to connect it with the centres of administration and commerce. Finally it is to be remembered that in just those parts of the country where the lines of communication are fewest they are also most difficult and most liable to interruption by adverse weather conditions; here transport is at its slowest and costs most per mile in time and effort. In short, it is clear that only in the Central Lowland areas are the means of transportation sufficient in quantity and efficiency to satisfy the demands of modern industrial operations. Throughout more than half of Scotland communications are so poor as to impose a real burden on industries already located in these "outlandish parts" and to deter seriously the establishment of new concerns. This poverty is largely attributable to the natural difficulty presented by large sections of the country, but we would here urge that this difficulty is by no means all insurmountable and that it is time to reconsider the improvement of Scottish communications as a national rather than a local question (Map 4).

4. The map showing accessibility by rail as measured by proximity to a railway station reveals at once that some 11,000 square miles of the mainland, or more than a third of the whole country, is by this simple criterion inaccessible. Practically the whole of central Scotland appears to be within 4 miles of a railway station, except for some eight or nine small areas. These however are not to be ignored for they are located upon hilly areas to which access is in any case difficult. In the Southern Uplands and Central Highlands large and continuous areas are far removed from railway stations, and moreover the latter are in some cases strung out along the railway at distances of 10 miles or more. In the north-western Highlands the proportion of the country which has access to the railway is very small. In a region as large as all Wales there are only 293 miles of railway altogether, and that is, of course, single track. Considerable areas are more than 20 miles from a station, and in the north-west of Sutherland Durness is 56 miles by road from the railway at Lairg. These facts are not without significance. Not only have they a bearing on that exodus of people, largely towards Glasgow, which has long been characteristic of the region, and thus indirectly upon the unequal distribution of industrial population in Scotland, but they have an immediate practical application in connection with the development in this remote region of industries based upon hydro-electric power (Map 5).

5. Accessibility must also be measured in terms of time as well as distance, and for this purpose a map showing the facts of access to and from the Capital is presented. On it are drawn isochronic lines for 1, 2, and 3 hours, that is to say, lines joining those points which can just be reached from Edinburgh by the fastest available trains (winter time-tables) in the times stated. These lines present a starfish pattern, showing that while one may progress to considerable distances along certain trunk lines, access from Edinburgh to the intervening areas is slowed down or is impossible owing to the broken nature of the country. Among the important commercial centres only Glasgow, Stirling, Falkirk, and Kirkcaldy are reached in an hour, and Dundee, Perth, and Paisley in two. Kilmarnoch, Ayr, and the Clyde ports are reached in under three hours, Aberdeen in three and a half, and Inverness is five and a half hours distant. A similar series of lines drawn about Glasgow would show similar though different relations. It has not proved possible to delimit for Scotland, as was the case with England, areas falling into different categories as regards accessibility within business hours. This arises from the fact that as soon as one leaves the central area, the railway network no longer deserves that name and access is offered only along a few selected routes. An attempt however has been made to indicate for those parts of the country which are in fact accessible, the category that is appropriate (Map 6).

Category I, in which a return journey can be made from Edinburgh between (roughly) 10 a.m. and 10 p.m. naturally includes practically the whole of Central Scotland and, along certain favoured trunk lines, places beyond it. Newcastle upon Tyne, Darlington, and Carlisle in England, Dumfries, Ayr, and Girvan in southern Scotland, Kingussie in Speyside and Aberdeen in the north-east represent the limits of the category, and in all cases the hours available for business only permit of interviews within the towns themselves. It should be noted also that certain "wayside stations" well within the central lowland are at present indifferently served by rail from Edinburgh, and it is impossible to include them in Category I; they are in all cases however accessible from Edinburgh by 'bus, and the journey may be completed easily between 10 a.m. and 10 p.m.

Category II. The additional area included by extending the travelling period is not large. It is possible to make the return journey to certain points in north-eastern Aberdeenshire, to Oban in the west, to Stranraer *via* Glasgow, and to Kircudbright in the south between about 6.30 a.m. and 11 p.m. A further area may however be included if journeys begun from Edinburgh between 4.0 and 4.30 a.m. on the through night expresses from London, be deemed to have been completed within a day. It is doubtful however if this is justifiable, since a series of such journeys could not be made upon successive days. Hence the places concerned, which include Fort William, Inverness, towns in the counties of Nairn, Moray, and Banff, and Fraserburgh and Peterhead in Aberdeenshire, should rather be regarded as falling in Category III.

Category III. This includes, in addition to the places just enumerated, a section of the counties of Kirkcudbrightshire and Wigtown between Castle Douglas and Stranraer, and some relatively accessible parts of the region north of the Caledonian Canal.

Category IV. In order to do business in the counties of Sutherland or Caithness it is necessary to spend two nights away from Edinburgh, of which one or both must be spent travelling, while Mallaig is only accessible by the 4.30 a.m. train from Edinburgh and a night spent in Mallaig. All the islands fall in Category IV.

From this it will be seen that although Scotland has little more than half the superficial extent of England and Wales, its remoter portions are further removed in time from the capital than is the case in the larger kingdom. Moreover this is equally true of access from Glasgow, except that from the latter city Fort William and south-west Scotland are slightly more accessible, and Aberdeenshire definitely less so. This state of affairs is to be attributed partly to slower speeds on express services between the large centres than are customary in England, and still more to leisurely branch-line services and indifferent connections. In Scotland, on all but a few journeys, albeit these include the most important ones, the business man's car can compete successfully with the train.

6. The road system of Scotland closely resembles that of the railways and is subject to many of the same limitations. In Central Scotland it forms a true network, wholly adequate to the needs of commerce and industry, except that all traffic between north and south must pass through the narrow waist of Scotland, whose extremities are the bridges at Glasgow and either Stirling or Kincardine, in each case 24 miles apart in a direct line. All north–south traffic must pass through this constriction and a considerable detour is involved in many cases. On the west the detour to the bridge at Glasgow only affects traffic between industrial Ayrshire and Dumbarton, together with the main road to Fort William and Inverness, and while a tunnel below the Clyde at Dumbarton is clearly desirable it is certainly not urgent. The case is different however in eastern Scotland where the long Firths of Forth and Tay interrupt the normal flow of traffic between Edinburgh and northern England on the one hand and between Edinburgh and Dundee and Aberdeen on the other. Dundee and Edinburgh are distant only 35 miles in a straight line: their rail connection by the Forth and Tay bridges is 59 miles long, while the trunk road route between them is 86 miles in length. The route by the new Kincardine bridge is shorter (74 miles) though still over twice the straight-line distance; but this bridge has not yet been linked to a through road route suitable for fast or heavy commercial traffic. It is believed in Scotland that direct road connection between Edinburgh and Dundee by new Forth and Tay bridges would do much to revive the fortunes of the latter city, and we believe such road connection to be pre-eminently in the national interest.

Outside central Scotland the major roads, like the railways, merely penetrate the upland regions, the two frequently running side by side along the same valley; they do not form a trunk network. These roads moreover are generally liable to blockage by snow in winter. It is in fact only on the "national" class roads across the Southern Uplands and the national roads to Inverness by Aberdeen and Fort William, that traffic is usually maintained without some interruption due to this cause (Map 4).

It will be noted that no roads are shown in the North-West Highlands other

than the national road which hugs the east coast from Inverness to Wick and Thurso. Again we would urge that this state of affairs needs to be remedied as a means both of improving conditions of life in these remote regions and so preventing the continual migration to the already congested industrial and commercial cities, and also of encouraging the exploitation of the local resources of hydro-electric power. The roads of this region remain poor and the system un-integrated, and until through communications are bettered by turning some of the existing tracks in the western glens into links in a main-road system, and by providing adequate and efficient ferry services across the sea lochs (or by bridging in some cases), the region as a whole will fail to contribute fully to the national economy.

The barrier to communications between Inverness and Wick presented by the three inlets of Beauly, Cromarty, and Dornoch Firths is a serious handicap to the commercial life of the north. Wick and Inverness are 75 miles apart on the map, but 130 miles apart by road, and 161 miles, or six hours, by rail. By bridging the Firths at Kessoch, Invergordon, and Edderton the road journey would be shortened to 96 miles only, but this might interfere with the use of the Cromarty Firth for Admiralty purposes and would also leave Beauly and Dingwall off the main road. A more practical rectification would be to bridge Dornoch Firth at Edderton and improve the direct road between this point and Alness to take commercial traffic. By this means a saving of 25 miles would be effected to the benefit of not only Wick and the extreme north but of the lowlands of eastern Ross and Cromarty besides.

7. Of all the maps presented with this report, none is more important than that which shows the distribution of persons employed in manufacturing industries, as recorded in the Census of Occupations 1931. Even casual observation will reveal its salient characters: the high degree to which Scottish industrial population is concentrated in a small area in the Central Lowlands, and the predominant part played by the four large cities in the industrial as well as the commercial life of the country. Almost exactly half the industrial population of the country is contained in these four cities, Glasgow claiming the lion's share; in percentages of the whole industrial population their relative importance is: Glasgow 30 per cent., Edinburgh and Dundee each 8 per cent., Aberdeen 4 per cent., total 50 per cent. The geographical concentration in the central area is even more striking. The green line on the map surrounds what may be termed the "Forth and Clyde industrial province," comprising the lower basins of these rivers and containing two-thirds of the industrial population of Scotland. Within this province the two yellow lines bound the constituent Clyde and Forth districts respectively with 37 per cent. and 30 per cent. of the workers in industry. The ascendency of the province in Scotland tends to increase, while within it the Forth district tends to gain on that of the Clyde in number of workers (Map 7).

Outside the Forth–Clyde area two subsidiary industrial districts may be recognized: the Perth–Dundee area, and north Ayrshire, with 12 per cent. and 5 per cent. of the Scottish workers respectively. It is noteworthy that these districts still lie within the central lowlands of Scotland and share many of the advantages of the main Forth–Clyde province: beyond these

regions there are no groupings of more than 15,000 industrial workers other than at the city of Aberdeen. Scattered in the valley of the Tweed and its tributaries are 15,000 workers with 3000 each in Galashiels and Hawick, and farther afield Inverness and Dumfries are the geographical focal or nodal points of regions relatively remote from the central area, each having some 3000 industrial workers. They represent centres to which industry might be attracted to a much greater extent if communications were improved.

The map showing the areas occupied by urban and close rural population (*i.e.* having population densities in excess of 200 to the square mile) confirms and supplements these conclusions. The main Clyde–Forth province stands out clearly, and within it the partition zone between the Forth and Clyde areas runs from Kilsyth to Wilsontown through upland areas of scanty population. The Perth–Dundee and north Ayrshire industrial districts are also clearly revealed. To this map has been added an indication of the changes of urban population in the decade 1921–31. The names of those burghs having populations of 12,000 or more in 1931 which increased by more than 3 per cent. in the intercensal period are underlined in red; those which decreased by more than 3 per cent. are underlined in blue. The increases show clearly the tendency at work. The nodal centres of each of the regions are increasing in size at a relatively rapid rate, while centres of lesser nodality remain stationary and the countryside as a whole suffers depopulation. Glasgow absorbs most of the increase in the Clyde area; Edinburgh, Falkirk, and Stirling in the Forth district; Kilmarnock in north Ayrshire; and Dundee and Perth in their own region. Outside the four main industrial districts, Aberdeen, Inverness, Hawick, and Dumfries are the only centres of pronounced growth. Decreases in larger towns are especially associated with the depression of industry in certain areas: the heavy metal and engineering industries of Clydeside and the Tail o' the Bank, the linen trade in Dunfermline, and the jute machinery industry in Arbroath. The substantial decline in population in Peterhead is typical of most of the Scottish herring ports—Fraserburgh, Macduff, Lossiemouth, Wick, Lerwick, etc. The parlous condition of this industry has already been the subject of reports and representations to the appropriate Minister, and is to be noted here as supplying a further motive for that migration away from the northern counties of Scotland which has already been noted (Map 8).

8. An examination of the distribution of workers in individual industries amplifies the more general conclusions of the preceding paragraphs.

Mines (146,000). The only mines shown on the map are collieries, of which there are nearly 250. Of these about 60 per cent. are in the large central coalfield, approximately 15 per cent. each in the Fife and Ayrshire coalfields, and the remaining 10 per cent. in the Lothian and the smaller Danglas, etc., fields. The map distinguishes collieries employing more than 1000 workers by a larger symbol, and 13 out of the 16 large mines are in the more recently developed Lothian and Fife fields. This is to be correlated with the fact that Lothian produces as much coal as Ayrshire from half the number of mines, and Fife with a number of mines equal to that of Ayrshire produces twice the Ayrshire output. While the map does not adequately reveal the number of

large mines in the central and western districts, it serves to emphasize that many collieries in these regions are small and old, some being near the end of their working lives. Oil shale is mined at a few points in West Lothian still, but the lead mines of Leadhills closed down finally in 1937. Quarrying employs considerable numbers, totalling over 6000, in Scotland distributed as follows: stone quarrying in Aberdeen and Kirkcudbright (granite); Lothian, Dumfries, etc. (building stone); Argyll (slate); Lanark, Fife, Ayr, Stirling, Lothian, and Peebles (road metal, etc.); Lanark and Stirling (sand and gravel). Since the bulk of the material is used in the densely peopled central districts the majority of the quarries are situated there also (Map 9).

Manufactures of bricks, pottery, and glass (15,000). A similar relation to that just pointed out in relation to quarries holds here also, nearly all the brickfields and potteries being in the Clyde–Forth area. More than half are actually in the lower Clyde area (52 per cent. with 22 per cent. in Glasgow itself). The Forth district has 25 per cent. and the north Ayrshire district 14 per cent., leaving only 8 per cent. or 9 per cent. of the Scottish total of workers in the remainder of the country. Next to Glasgow, Ayr and Edinburgh are the most important centres of the industry which arose on the glacial and raised-beach clays of these three localities (Maps 10 and 11).

Chemical industries (21,000). The workers in these industries have not been mapped, but from the map showing the location of works operating at the time of the Scottish Development Council's Survey it is clear that the industry is almost exclusively centred in the four large towns: Glasgow, Edinburgh with Leith, Dundee, and Aberdeen, together with Grangemouth, Irvine, and Renfrew, all of which are in waterside situations favouring the assembly of raw materials and with ready markets close at hand.

Metal and machinery industries (280,000). In Scotland the metal industries are concentrated to a high degree in the Clyde area, and the smelting and refining of iron almost exclusively so. Except for blast furnaces at Carron, and Ardeer (now idle), and steel works at Glengarnock, Denny, and Bathgate, the whole of the iron and steel working plant in Scotland is concentrated in a small area about 24 miles in length (from Paisley to Shotts) and about 5 miles across. The factors that originally led to this concentration were largely geographical (the occurrence of local ores), but they have long since ceased to operate, and the inland situation of the works is now a disadvantage to an industry which is based mainly upon imported raw materials. Removal of the industry to better-favoured tidewater locations (*e.g.* at Ardeer and Ardrossan, Grangemouth, or east Fife) would involve also the transference of a large body of labour skilled in the working of hot metals and can thus be considered only in relation to large-scale planning. The working of non-ferrous metals would also be essentially confined to the Clyde and north Ayrshire, were it not for the manufacture of aluminium in the west Highlands: 47 per cent. of the workers in this group are employed at the aluminium works at Foyers, Fort William, and Kinlochleven, and a further 18 per cent. in the bauxite refinery at Burntisland in Fife, but out of the remaining 35 per cent. the Clyde claims some 30 per cent. Foundry work is more widely distributed, and most of the larger commercial towns and the fishing ports have some small share in this. Glasgow leads, however, with 31 per cent. of the workers, and

Airdrie (7 per cent.), Falkirk (6¼ per cent.), Edinburgh and Shotts (each 4½ per cent.), are the other principal centres (Maps 12 and 13).

The manufacture of cutlery and small tools and the working of precious metals employ together less than 3000 people in Scotland, but here again the same prominence of Glasgow (40 per cent.) and the Clyde region (51 per cent.), and to a lesser extent of the Forth region with its chief centre in Edinburgh, is evident. Miscellaneous small metal industries grouped together in the census of industries and occupying some 32,000 workers altogether reveal again the same concentration in the Clyde region. Glasgow has 37 per cent., the Clyde area 72 per cent. of the workers in this group; of the remaining 28 per cent. all but 4 per cent. are in the Forth district, where Falkirk (11 per cent.) and Edinburgh (7 per cent.) are the chief centres (Map 14).

Electrical apparatus manufacture is of minor importance in Scotland, employing only about 12,000 people. Of these, 52 per cent. are in the Clyde district with 37 per cent. concentrated in Glasgow, while 29 per cent. are in the Forth district with 19 per cent. concentrated in Glasgow. Numbers elsewhere are negligible (Map 15).

Textile industries (*excluding clothing*) (152,000). The making of textile fibres and fabrics is the most widespread and in many ways the most characteristic of Scottish manufacturing industries. In point of numbers it stands second only to the manufacture of metals and machines, but in its distribution it is sharply contrasted with the latter industry. All the branches of the metal and machinery industries are represented in the Clyde and to a lesser extent in the Forth areas and most of them are concentrated there almost exclusively. Textile working on the other hand is distributed over all Scotland from Dumfries and the Borders to the Outer Isles, and the different fibres, cotton, wool, silk and jute (with flax and hemp) are largely worked in independent regions, of which two are situated entirely outside the circumscribed Forth–Clyde province which so largely overbalances the industrial structure of Scotland (Maps 16 and 17).

Flax, hemp, and jute working (54,000) is the largest of the Scottish textile industries, and employs a third of all the textile operatives in the country. It is localized to a high degree in the counties of Fife and Angus, which have over 90 per cent., and especially in the city of Dundee, which has 67 per cent., of all the workers in the industry. On the map constructed from the Scottish Development Council's Survey a red line has been drawn to include the principal factories working in flax, hemp, and jute, and it will be seen to enclose a very compact area extending from Dunfermline by Perth and Blairgowrie to Brechin and Montrose. Outside this region these fibres are worked to a small extent in the city of Aberdeen (3 per cent.) and in the counties of Ayr and Renfrew (2 per cent.). In the recent depressed state of this industry the region where it is so strongly localized has naturally suffered considerably and the city of Dundee most of all.

Wool working in its several aspects forms the next largest textile group (20,000), and if hosiery and carpet manufacture (22,000 and 8000) be included, another third of the Scottish textile operatives are accounted for. Wool working is the most widely distributed of all Scottish industries, practically every county having at least 200–300 workers. The exceptions are note-

worthy and comprise the counties of Orkney, Caithness, and Sutherland in the north, Argyll and Bute in the west, Wigtown and Kirkcudbright in the south, and Angus, Kinross, and Kincardine in the east. In the latter region it is excluded by flax and jute working, and in the north and in Argyllshire, the woollen industry is a cottage industry carried on by crofters. In these Highland counties and in Galloway the tradition of working wool still survives, and since the industry is pre-eminently suited to working in small units based upon local water or electric power, provided the units are grouped for marketing purposes, it would seem that given better road communications in these regions much might be done to foster the development of a small-scale woollen industry in regions where industrial development is otherwise likely to prove almost impossible. The main centre of wool working lies entirely outside the dominant Forth–Clyde industrial province, in the valley of the Tweed and its tributaries. Here are to be found practically 50 per cent. of the Scottish wool workers, including most of the workers in hosiery and knitted goods, and a further 6 per cent. are in the county of Dumfries. The small towns of the counties bordering on the Moray Firth, with Aberdeen city, contain a further 12 per cent., leaving only a third of the workers to Central Scotland (Forth district 13 per cent., Clyde 9 per cent., and north Ayrshire 8 per cent.). Carpet workers are almost all found in the region included between Glasgow and Ayr.

Cotton working (20,000) is as strongly localized as flax and jute manufacture, but the localities do not overlap. The area in which cotton mills occur is surrounded by a brown line on the map and extends from Lanark and Kilmarnock to Dunblane and the Vale of Leven in Dumbarton. Cotton thread working occupies more than half the workers and is chiefly carried on in Paisley and neighbouring centres.

Silk (2000) is of minor importance, occupying fewer people than are employed in rope making and allied trades (5000). It is located partly in the established centres of cotton working in the Clyde area and partly in the wool working centres of Jedburgh and Galashiels.

Finally it should be noted that 13,000 workers are employed in bleaching, dyeing, and finishing textile fabrics. These works are naturally situated beside abundant supplies of pure water and the uplands of southern Renfrew, and the Tay valley above Perth are noteworthy.

9. The conclusions to be drawn are summed up as follows. Before the Industrial Revolution such industry as existed in Scotland was mainly to be found in the numerous burghs of the east central regions between the Tweed and the Tay. During the nineteenth century there occurred an enormous growth of heavy industry based upon local coal and iron ore with transport during the early formative phases chiefly by canal, but later by rail. This growth was predominantly in the region between Stirling and Ayr, and especially in the areas bordering the Clyde valley, and it completely shifted the centre of gravity of industrial and commercial Scotland from east to west. It left the country with an industrial structure which was concentrated to an unhealthy degree upon the heavy metal industries and in an extremely restricted area, and it left it also with a population pattern and a system of

communications focused upon this same region. Throughout most of its existence the Clyde industrial region has produced largely if not primarily for the overseas market and latterly it has had to depend increasingly upon imported raw materials. The activities of the region have thus become in some measure divorced from those of the remainder of the country which are more concerned with the satisfaction of its internal needs and the utilization of local resources. With the general contraction of world trade the Clyde region found itself over-specialized and over-equipped with plant (not infrequently antiquated and badly sited) and with labour, and in consequence part of it has been scheduled as a Special Area.

Clearly a broadening of both the geographical and the economic basis of Scottish industry would be a desirable change and such a change would be the more valuable if it brought Scottish industry into closer relation with other Scottish economic activities by utilizing local resources and satisfying local needs more completely. The alleviation of distress in the Scottish Special Area is clearly a matter of urgency, but the fostering of industries in the other industrial areas (the Forth district, the Perth–Dundee area, north Ayrshire and the Tweed valley) is a matter of greater ultimate moment. The Perth–Dundee area, while, and indeed because, it shows signs of active and healthy growth, has perhaps greatest claims for Government encouragement and assistance. The linen and jute industries which form the basis of the industrial life of the district are without parallel in Britain and are too valuable a national asset to be allowed to languish. The whole economic activity of the region would moreover be greatly strengthened by the provision of improved road facilities in the form of road bridges across the Firths of Forth and Tay, and indeed it is probable that without such improved communications no permanent increase in the industrial activity of the district is possible. Similarly it is clearly advisable that the life of the remoter parts of Scotland should be stimulated as far as possible, and Dumfries in the south, and Inverness in the north, as the nodal points most favoured by geographical circumstances are marked out as the centres of this new activity. Both are amongst the most rapidly growing Scottish burghs, showing intercensal increases of about 5 per cent. each, but any considerable industrial growth must presuppose some improvement in communications in both cases. Dumfries is as far from Edinburgh in time as either Aberdeen or Newcastle, and Inverness is effectively as far removed from Glasgow and Edinburgh as these cities are from London. Finally it is desirable to bear in mind the possibility of establishing small or large plants in isolation, depending on local hydro-electric or water power in northern Scotland or drawing power supplies from the grid in southern Scotland, but again the pre-requisite would be the improvement of the means of communication. Viewed from the geographical angle, it appears that accessibility is the crux of the problem, and that the unit of planning must be, not the town and its neighbourhood, not even the region, but the country as a whole.

10. The list of maps for Scotland is as follows:

1. Distribution of overcast skies and daylight in December.
2. Distribution of fog.
3. Distribution of sunshine.
4. Distribution of Class "A" and National roads.
5. Accessibility to railways.
6. Two-way accessibility by rail (Edinburgh).
7. Distribution of the industrial (factory) population.
8. Densely peopled areas (Urban and close rural).
9. Actual location of coal-mines.
10. Location of works, Category IV.
11. Distribution of persons employed, Category IV.
12. Location of metal-working industries.
13. Distribution of persons employed, Category VI.
14. Do. do. sub-orders 8 and 10.
15. Do. do. sub-order 5.
16. Location of textile factories.
17. Distribution of persons employed, Category VII

APPENDIX: SNOWFALL AND ITS RELATION TO TRANSPORT PROBLEMS, WITH SPECIAL REFERENCE TO NORTHERN ENGLAND

GORDON MANLEY

1. Snowfalls are an important factor in the location of industry, as they affect transport problems in two ways: by blockage of roads by snow, snow drift, or by a combination of both; by formation of ice surface by alternation of frost and thaw. Icy roads due to snowfalls in general present little difficulty unless the country is hilly; complaints in the neighbourhood of large towns are seldom justified except in the rare instance of a glazed frost which is not due to snow.

2. In recent years however a second difficulty has arisen at lower levels with the increase in road traffic, namely, "potholed ice" (a phenomenon common, *e.g.* in Ontario, wherever heavy traffic is experienced), which in northern England has caused serious delay and breakdown of transport services. This is liable to occur in special circumstances only, and, like extensive local flooding, excessive heat, or protracted thick fog, may be disregarded here.

3. Over Great Britain as a whole, roads close to the coast, and those in lowlands below the level of approximately 300 feet in Scotland and northern England, and 500 feet in southern England, are practically never blocked. The last twenty years' records point, for example, to one blockage of the Great North Road near Berwick, at 300 feet (1937); one of coast roads in Durham at 400 feet (1933); one of roads in Sussex–Surrey (1927) at *c.* 500 feet (also in Hampshire, 1937, and in Cornwall, 1933), and one east of Leeds (1933) at 300 feet; lowland roads in north-east Scotland (1924) at *c.* 300 feet have also been blocked. The delay, on main roads, was never more than a day or two at these levels as far as can be judged. No case of blocked roads appears to have occurred near the west coast below *c.* 500 feet (1937, 1922, and 1908). Snow below 300 feet in the north and 500 feet in the south may reasonably be disregarded.

4. It may be assumed that motor vehicles can proceed through snow up to 10–12 inches in depth. Snowfalls which attain depths greater than this, apart from drifting, have rarely been recorded at low levels. Further, a drifting fall at low levels (below 300 feet) is rare, as the necessary condition is a surface temperature below 32° during a heavy fall. For orographic reasons, the quantity of snow falling in any given storm generally increases very rapidly on all the uplands of Britain exposed to the east and north-east, and, in less degree, to the south-east and north. Further, the rate of increase in *duration* of a snow-cover with elevation is even more marked. The following examples are based upon Meteorological Office and other data:

Approximate frequency of snow lying (annual average)

North-east coast of England	about	6	days
Durham County	500 feet	20	,,
Northern Pennines	1800 ,, ...	70	,,
	2700 ,, ...	(?) 100	,,
South and Central Pennines: Buxton	1000 ,, ...	25	,,
Darwen	720 ,, ...	12	,,
Eastern Lake District: Newton Rigg ..	560 ,, ...	18	,,
Central Wales: Rhayader	760 ,, ...	15	,,
Dartmoor: Princetown	1350 ,, ...	18	,,
Southern Uplands (West Slope):			
Eskdalemuir	800 ,, ...	25	,,

(Taken over most of years with available figures, 1912–1938, with adjustments.)

5. At the same time the majority of serious snowfalls at levels above 1000 feet are accompanied by drifting. As English uplands are largely bare of trees and hedges at and above this level, serious drift-blockages are liable to occur on all roads in the Pennines at altitudes of 1000 feet and over, as well as in other upland regions. A very rough estimate of the frequency of reports of "blocked roads" is given in para. 11. The number of reports made available however depends a good deal on the altitude of roads and the interest of the local Press. Many main roads can of course be circumvented by lower routes, *e.g.* the Leeds–Huddersfield–Manchester main road (A.62: 1250 feet) can be avoided by way of Todmorden (maximum elevation 800 feet). Similarly the Carter Bar route to Scotland (A.68: 1050 feet West Durham, 1300 feet on Cheviots) can be avoided by A.1 (Berwick) or A.697 (Wooler).

6. It is therefore unnecessary to consider all main roads; but the following are especially important in Northern England, and for these an estimate of the number of days of "snow-lying" at the summit section of the road has been made:

A.68	Darlington–Corbridge–Carter Bar	1300 feet	45	days
A.686	Haydon B.–Alston–Penrith	1900 ,, ...	70	,,
A.6	Kendal–Shap–Penrith	1400 ,, ...	35	,,
A.66	Scotch Corner–Stainmore–Brough[1]	1480 ,, ...	45	,,
A.684	Leyburn–Hawes–Sedbergh	1100 ,, ...	20	,,
	(*also Kirkby Stephen–Kendal, A.*594)			
A.59	Harrogate–Skipton	1000 ,, ...	25	,,
A.65	Leeds–Ilkley–Skipton	800 ,, ...	20	,,

[1] The main Glasgow road from London.

A.58	Leeds–Rochdale[1]	1300 feet ..	.. 30 days
A.62	Leeds–Manchester[1]	1250 ,, ..	.. 30 ,,
A.629	Halifax–Keighley	1100 ,, ..	.. 25 ,,
A.628	Barnsley–Manchester	1450 ,, ..	.. 30 ,,
A.57	Sheffield–Manchester	1680 ,, ..	.. 40 ,,
A.6	Derby–Buxton–Manchester	1400 ,, ..	.. 30 ,,
A.56	Manchester–Burnley	1000 ,, ..	.. 20 ,,
A.666	Manchester–Blackburn	900 ,, ..	.. 15 ,,
A.537	Buxton–Macclesfield	1690 ,, ..	.. 35 ,,
A.625	Sheffield–Buxton	1200 ,, ..	.. 30 ,,
A.169	Pickering–Whitby		
A.171	Guisborough–Scarborough	800–900 feet	.. ?25 ,,
A.170	Sutton Bank–Helmsley		

The figures are approximate only, partly because of differences of opinion as to what constitutes "snow-lying."

7. Experience suggests that, of all days on which snow is lying at the summit-level of roads up to 1000 feet, perhaps one-quarter have drifts at or about that level which make progress difficult or impossible without extensive digging. Below 1000 feet drifting sufficient to block main roads is infrequent. Above 1500 feet perhaps half the days on which snow is lying have drifts which impede progress. These fractions apply to the northern and eastern Pennines; in the western Pennines and Lake District the proportion of "days with blocks due to drifting" to "days of snow cover" is considerably smaller. Broadly these estimates may be put as follows:

Average annual hindrance due to snowfalls:

(Durham)		*Snow lying*	*Roads blocked by drifts*
N. and E. Pennines:	1000 feet	30–35 days	7–10 days
	1500 ,,	*c.* 45 ,,	20–30 ,,
Central and S. Pennines	1000 ,,	25 ,,	? 5 ,,
	1500 ,,	35 ,,	? 15 ,,
W. Pennines and Lake District	1000 ,,	15 ,,	? 2–3 ,,

These again are approximate figures and take no account of efforts made to clear the roads by public authorities. They provide however an estimate of the hindrance due to snow in upland districts in an average year. In exceptional years the above figures rise very greatly, *e.g.* in 1937 no traffic was possible above *c.* 1600 feet in county Durham for 5–6 weeks during February and March, and for 2–3 weeks in December, despite considerable effort.

8. In discussing actual road-blocking however an entirely different set of factors must be taken into account, namely, the efficiency of clearing methods, and counties vary considerably in this respect. In Durham and Westmorland for example the snow-ploughs are used very effectively; they can deal with up to 12 inches of snow or thereabouts. With heavier falls, large gangs of men must dig cuttings and owing to further drifting it may be very difficult to keep these clear. The location and lay-out of roads is also very important. The Stainmore road (A.66) carrying heavy traffic to Glasgow, is for long distances unfenced and on a small embankment, with the result that it is swept almost

[1] Can be avoided, but are important routes.

clear; at certain points however in the lee of the embankment on the west side of the watershed it is commonly blocked. The Alston–Penrith road (A.686) similarly tends to be blocked in places. It seems clear that, if necessary, a certain amount of rebuilding and re-siting of roads, coupled with the erection of small protecting screens (after the fashion adopted on Norwegian winter 'bus routes) would make blockage by snow a very rare occurrence even at high levels. The Shap road (A.6) gives trouble because drifts tend to accumulate at a point where the gradient is considerable, a little to the south of the summit. Further, it can only be avoided by a long detour through the Lake District. Another road (A.628, Penistone–Manchester) has a cutting near the summit (1460 feet) which is duplicated by a rough "snow road" over the open moors which avoids the drifts in the cutting. There is similar frequent blocking in Soutra Hill cutting on the Lammermuirs, 1100 feet (A.68, Lauder–Edinburgh).

9. A point not yet touched upon is the difficulty due to icy roads on steep slopes. On account of the contour of the Pennines most of the more serious gradients are at altitudes below 1000 feet, where the frequency of snow-cover diminishes considerably; but this point should be remembered in considering the accessibility of some smaller centres. The Halifax Corporation Tramways, and also those of Bradford operate successfully however to very high-lying suburbs on steep gradients. Local authorities vary considerably in their practice of sanding or gritting icy roads; the efforts of the Westmorland Council in this direction appear to be especially effective. In sum, many, if not all, local difficulties could be overcome by better snow-ploughs, by more efficient sanding or gritting of icy slopes, and at higher levels by re-alignment or perhaps by a little snow-fencing on the Norwegian model. Indeed, this is practised at one or two points in Scotland.

10. South Scotland only has been mentioned, as the Highlands present problems remote from northern England; but it may be observed that the siting of the Perth–Inverness road (A.9) ensures that over long distances drifts do not accumulate on the road itself. With regard to southern England (*e.g.* Salisbury Plain) and the Yorkshire Wolds, the frequent reports of obstruction which follow severe snowstorms show that roads dipping into slight hollows in open country are easily blocked by drifts. The narrow, walled roads in the East Pennines are probably frequently blocked while the relatively wide and open main roads remain clear: in this connection a broad grass verge is important. In South Wales the Black Mountain and Brecon Beacons area is subject to heavy snowfalls and roads are at times impassable. In Devonshire the low country to the south-west of Dartmoor is liable to road-blocking by snow blown off the moor.

11. The following is an estimate of the frequency of "blocked roads," in all districts south of Edinburgh–Glasgow. The figures represent a very tentative estimate of the number of years in ten during which at one period or another considerable blocking of roads may be expected; that is, main roads impassable for 2–3 days and side roads for longer periods.

(1) Northern and N.E. Pennines, also eastern Border Counties of Scotland; south to central Yorkshire	10 years
(2) Central and S.E. Pennines	8 ,,
(3) N.E. Yorks. Moors, and, to a less degree, Yorks. Wolds ..	5 ,,
(4) Lancashire Pennines including Rossendale; Shap Fell; and Lake District; also S. Scotland	4 ,,

(5) North and central Wales	3 years
(6) S. Wales, Exmoor, Dartmoor, Salisbury Plain, Hants., E. Kent	2 ,,
(7) Chilterns, Cotswolds	1 ,,

(8) In the High N. Pennines above 1500 feet more than one period may be expected each year on most of the roads.

12. It is pointed out by Mr. L. C. W. Bonacina, who has made a special study of snowfall, that the British Isles occupy a somewhat marginal position in respect of this phenomenon, and hence that slight climatic changes such as are likely to occur in passing into a new phase of the climatic cycle may have disproportionate results. The meteorological conditions of the present century are characterized by milder winters than obtained during the latter part of the previous century, and a return to severer conditions may be expected.

Authorities: M.O. Book of Normals, and Monthly Reports; data mostly 1912–1938. Meteorological records from writer's private stations in High Pennines. Wide personal experience (of Pennines chiefly) and close observation of snow. Fifteen years' Press Reports.

Note by the Editor G.J.—The Memorandum printed above was given in evidence (15 November 1938) to the Royal Commission on the Geographical Distribution of the Industrial Population, to whom we are indebted for permission to publish it. The maps referred to in the text were on view in the Society's House on the occasion of the Discussion opened by Professor E. G. R. Taylor on 16 May 1938. Seventeen of them were reproduced to illustrate the report of the Discussion which appeared in the *Journal* for July 1938. These maps, which are at present in the possession of the Commission, will ultimately be placed in the Society's collection.

THE SIMI VALLEY, CALIFORNIA

ROBERT M. GLENDINNING

THE Simi is essentially a hidden valley. Unseen on approach, because of its enclosing hills and mountains, it suddenly stretches before the eye only when its edge is attained. From the San Fernando valley and Los Angeles plain, to the east and south-east, a main paved highway twists over the Santa Susana pass and descends abruptly to the eastern end of the Simi valley floor. From the west, from the direction of Moorpark and Ventura, a similar route, traversing a low pass, enters the western edge of the Simi valley through the narrows of the Arroyo Simi. No routes enter the Simi except at the eastern and western ends. The northern and southern hills and mountains have, so far, effectively discouraged transverse connections with other valleys on either side (Fig. 1).

From any vantage point on the surrounding hills the geographic essentials of the Simi are readily apparent. A broad, elongated valley floor, giving way sharply to encroaching hills, is gridded with numerous road lines, most of which are marked by the dark green walls of the parallel tree windbreaks. Partially hidden by these tall trees, the rural and semi-rural dwellings of the valley hug the roads' edges. Large and small land rectangles, outlined by the roads and the tree walls, are given over to a variety of tree crops, truck crops, and grain hays.

The flattish valley floor, which is the Simi in a terminological sense, represents the pronounced aggradation of the lower portion of an asymmetrical syncline whose axis trends almost east and west (Fig. 2). The plain consists largely of materials derived from the shales, sandstones, and conglomerates of the northern hills.[1] More extensive drainage basins to the north, coupled with more easily eroded formations, have supplied the intermittent streams of that section with more abundant materials. As a result, the occasionally debouching waters of the northern hill zone have built extensive fans far south of the northern hill edge. The fans have coalesced laterally to form a continuous alluvial piedmont of very low gradient. The excess deposition from the north has, in general, pushed the Arroyo Simi, marking the thalweg, close against the southern margin of the valley floor. In the south-western portion however both recent and older alluvial fill have pushed the longitudinal drainage line toward the north, so that the Arroyo Simi finally turns north-westerly to leave the valley by way of the narrows.

The slope of the valley from north to south and from east to west is so slight as to be almost imperceptible. This apparently flat floor has few landform interruptions (Fig. 3). In the south-eastern portion are several rocky outliers, representing unburied sandstone knobs, which belong geologically to the massive Chico sandstone of the Simi Hills. North-west of these prominent sandstone exposures, where the valley floor begins to assume its greatest

[1] For geology of the Simi area, see Kew, W. S. W., "Geology and oil resources of a part of Los Angeles and Ventura Counties, California," *Bull.* 753, *U.S.G.S.*, 1924; and "Southern California," Guidebook 15, Excursion C–1, XVI International Geological Congress, United States, 1933, Washington, 1933 (esp. pp. 55–57 and Plate 11).

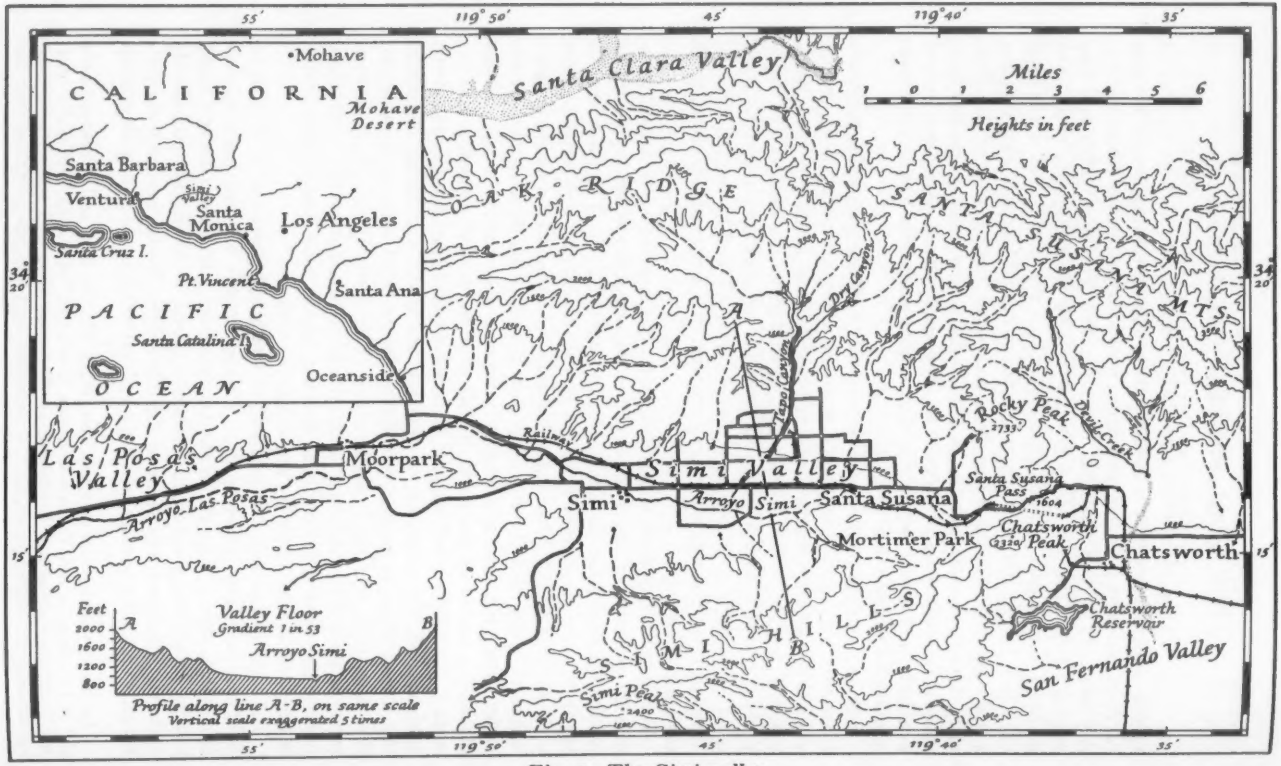


Fig. 1. The Simi valley

width, are two low knolls of soft shaly material representing high spots in the underlying surface of the Eocene formations. In the south-central and south-western parts of the valley are low bench lands, which stand but slightly above the valley floor and extend south, up very gentle gradients, to the lower edges of the hills. These benches are in part cut through and bordered by shallow drainage ways floored with recent alluvium. Such arroyos give way on their margins either to the steep slopes of the hills or to the also steep, but short, slopes of the benches. The benches to the south-west are composed of fine, unconsolidated materials. Geologically these have been classified as remnants of a late Pleistocene non-marine terrace. The other bench area, in the south-central portion of the valley, is underlain by eroded shales and sandstones of Eocene age. Over its surface are deposits of apparently residual soil which are broken by bands of very loose materials of recent water deposition. In addition to the slight valley floor interruptions just noted, the intermittent Arroyo Simi and its tributaries have cut minor valley floors into the general level. These arroyos, or *barrancas*, are normally steep-sided and narrow, but in some places they are only surface washes with very low banks and poorly defined channels. Even where sharply incised their depths seldom exceed 20 feet.

As adjuncts to the main valley floor there are several tributary, and also flattish, valley floors which reach into the insequent canyons of the hill country. The largest of these is the ribbon of aggradation which extends north into the lower portions of Tapo and Dry Canyons.

The enclosing hill lands, comprised of deep canyons and well-defined ridges, represent a portion of the transverse ranges of the California Coast Ranges. The highland area south, south-east, and east of the Simi valley is the high rugged block of the Simi Hills (Fig. 3). Composed of layers of coarse sandstone which dip strongly to the north and north-west, this mass has weathered and eroded to form huge castellated blocks which surmount nearly barren dip slopes of solid Chico sandstone. In the crest portion of Santa Susana pass, and in the highlands on either side, these great blocks and cliffs resemble a line of large and small stone fortresses. Lapping up on the Chico formation from the north-west, younger shales, conglomerates, and non-massive sandstones have produced a more subdued land-surface, which constitutes the foothill margin of the western three-fourths of the southern edge of the valley floor.

The northern and north-eastern hill margins consist of much weathered and intricately dissected marine and non-marine shales, sandstones, and conglomerates. These form the foothill sections of Oak Ridge, to the north, and of the Santa Susana mountains to the north-east. Unlike most of the Simi Hills area, these more thinly bedded formations have not produced bold, blocky forms. They do however sweep on north, ridge after ridge, to elevations comparable with those of the southern hill backbone. Many of the canyons follow the generally east-north-east to west-south-west strike of the rock strata; others cut obliquely or at right angles to the strike. The result is a labyrinth of deep narrow valleys and sharp-crested to rounded ridges.

On the west, other hills, though comparatively lower and more subdued,

Fig. 1. The Simi valley

complete the enclosure of the Simi valley floor. This western rim is completely broken only in the narrows section of the Arroyo Simi outlet. West of the town of Simi the low hill rim is conspicuously buttressed by an abrupt and peaked mass of andesitic and basaltic materials.

The major land-surface divisions of the Simi area, hill country and valley

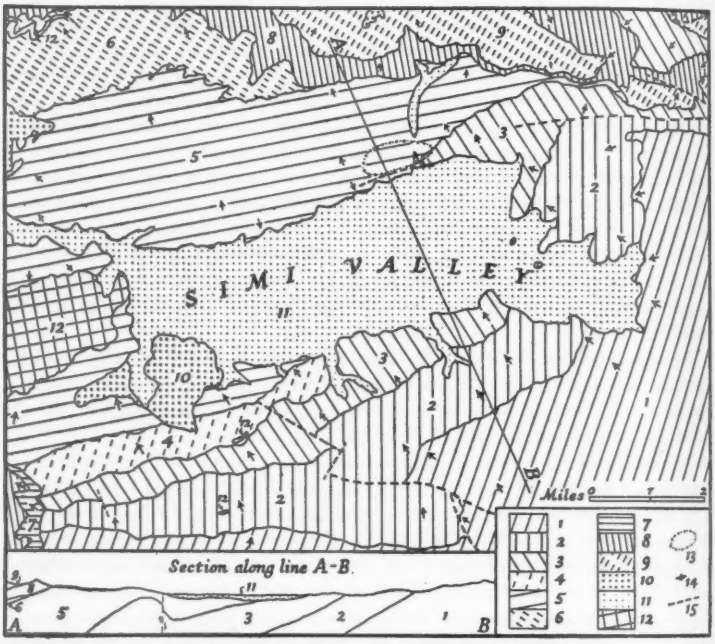


Fig. 2. Geological map of the Simi valley

1. Cretaceous massive brown marine sandstone (Chico formation); 2. Eocene marine conglomerate, shale, sandstone (Martinez formation); 3. Eocene marine shale, conglomerate, sandstone (Meganos formation); 4. Eocene marine sandstone, conglomerate (Tejon formation); 5. Oligocene nonmarine sandstone, conglomerate, shale (Sespe formation); 6. Miocene marine sandstone, conglomerate, little shale (Vaqueros formation); 7. Miocene marine sandstone, conglomerate (Topango formation); 8. Miocene siliceous shale, sandstone (Modelo formation); 9. Pliocene and Pleistocene marine and nonmarine soft sandstone and loose conglomerate (Saugus formation); 10. Pleistocene nonmarine terrace deposits of gravel, subangular conglomerate, interbedded fine material; 11. Recent alluvium: clays, sands, gravels; 12. Miocene igneous: andesite and basalt extrusives and intrusives; 13. Simi oil field; 14. Direction of dip; 15. Fault.

floor alike, are fundamental not only to a true mental picture of the region, but also to an understanding of the manner in which the area is being utilized. Virtually all landscape factors, from soils to population, take cognizance of the relationships between the valley floor and the bordering hill country.

Well aware of the landforms of the Simi area, man has pushed forward his lines of circulation and settlement in accord with the available lands of very low relief. The modern period of occupation was first marked by the extensive use of the valley floor, and also of the adjacent portions of the hill country, by a few cattle ranchers. During the last decade of the past century however a small group of colonists established a settlement at Simi. These small landowners inaugurated the period of more intensive land-use which has continued to the present day.

In 1900 the major part of the population was located at Simi and in the

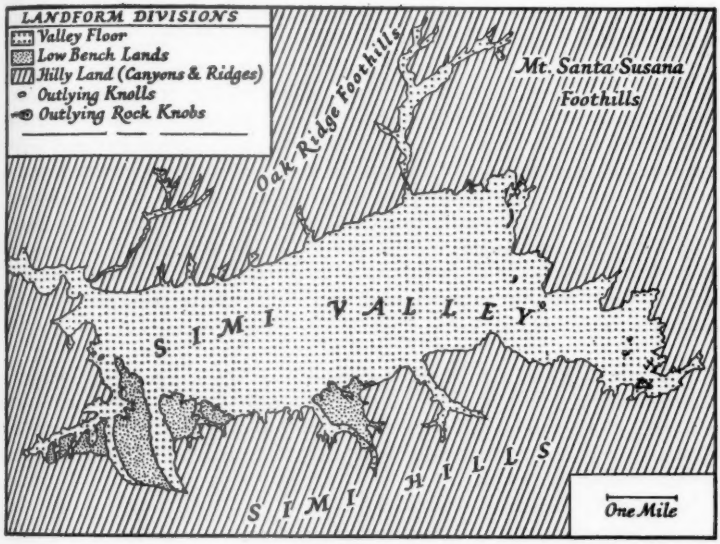


Fig. 3

adjacent portion of the valley floor to the south-east. The approximately rectangular road pattern ran skeleton-like throughout the valley, although less well developed in the eastern part. The main highway and the railroad, recently completed, occupied their present positions and insured connections with the valleys to the east and west.

Seventeen years later the road pattern had become more elaborate and the dwellings, though still concentrated in the south-western part of the valley floor, are to be found scattered throughout the area of alluvial fill. Except for certain canyon floors, the roads and homes are still nearly absent from the rough, thinly soiled hill country. Not only were flat land and deep soils desired by the agricultural population, but also water for domestic and irrigation purposes. Such water is present in important amounts only in the loose fill of the main floor and in the tributary floors of the few larger canyons. With the rains of the cool season Tapo Canyon, the largest of the insequent valleys, collects and sends large quantities of water into the north-central

margin of the main valley. Other canyons play lesser rôles in the replenishment of the underground waters necessary to meet the long hot season of drought.[1] By 1917 the existence of relatively more abundant water in and near the mouth of Tapo Canyon had begun to affect the texture of the settlement pattern on the alluvial piedmont of the Simi.

The 1937 distribution of roads and dwellings portrays the pronounced elaboration of the patterns. Extensive land holdings have been further subdivided, large ranches devoted to livestock have relinquished the valley floor to small ranches producing several varieties of tree and field crops, more land is under irrigation, and more lines of tall eucalyptus rise to break the force of the strong spring north-easters and protect the often delicate crops. Road and rail connections have been well integrated. Urban centres, near and far flung, receive the oranges, walnuts, apricots, beans, etc., which have made possible the more dense peopling of the Simi valley. Thus, since 1900, the centre of population has shifted steadily eastward across the valley floor until, at present, the central and north-central portions form the core of the settlement. Even the hill country is no longer totally without population, for the decade previous to 1937 witnessed the development of a pleasure and health resort in the extreme south-eastern part of the area. This development, known as Mortimer Park, lies partially on the rugged and picturesque lower slopes of the Simi Hills. To-day, there are two hundred and forty dwellings, most of which are permanently occupied, and expansion is continuing.

The present day utilization of the valley floor is almost entirely agricultural. Grazing has been pushed to the hills, and the piedmont alluvial plain is now a mosaic of large and small fields producing typically Mediterranean crops. There is however some variation in the pattern of agricultural land-use in the various portions of the plain.

In the east, large fields chiefly of black-eye beans and grain hays are the rule. A few small walnut and apricot groves break the pattern of the field crops, especially at the immediate edge of the easterly hills. The absence of the tall tree windbreaks further emphasizes the more open character of the land-use in the eastern plain. Lack of water for irrigation has led to the more extensive use of the land and a choice of crops that require little or no irrigation (Fig. 4).

The central section of the plain is largely devoted to citrus, walnuts, and truck crops (Fig. 4). The citrus groves, chiefly orange, lie almost entirely on the upper slopes of the plain, near the northern hill border where irrigation water from the canyon gravels is more abundant, and where excellent air drainage minimizes the dangers of January and February frosts. Small landholdings, many windbreaks, intensive land-use, heavy irrigation, and closely spaced dwellings, partially hidden by trees and shrubs, characterize this citrus district. Numerous paved roads, well-kept lawns, and modern dwellings, many in the Spanish style, give this district the aspect of a high-grade suburban development. It is a landscape which is neither truly rural nor truly urban.

[1] For general climatic considerations, see Russell, R. J., "Climates of California," *U. of Cal. Pub. in Geog.*, vol. 2, No. 4, 1926.

Tapo Canyon, Simi valley

Central Simi valley, looking north

Western portion of the Simi valley, with Simi on the right

South of the citrus district, fields and groves are larger, dwellings more disseminated, and irrigation water is obtained from electrically pumped wells located on individual properties. Such pumping is lowering the ground water table. For example, in 1900 one well in this section obtained water at 75 feet; to-day it is pumping from 125 feet.

The western portion of the plain, south of the railroad, produces mainly beans, barley hay, and tomatoes. North of the railroad, walnuts are dominant, but they share the upper margin of the valley floor with apricots and, toward the hills, citrus (Fig. 4).

In addition to the crops so far noted there are many others of lesser importance, including wine grapes, white (Kadota) figs, carrots, melons, corn, and alfalfa.

The contrasting hill country is largely idle. It is covered with a sparse to occasionally dense thicket-like growth of chaparral and weedy grasses. Some portions are given over to cattle grazing and are fenced along property lines: a contrast to the valley floor where fences are seldom seen. A few lower slopes, next to the valley floor, are in fields of barley hay. Such fields usually show abnormal sheet erosion because of the steep slopes, the torrential winter rains, and the breaking of the ground by the plough. The brushy and weedy growth of the hills is a constant fire menace, especially towards the end of the hot, dry summer season. Destruction of this chaparral cover by fire allows the winter rains to do a great deal of local damage along the margin of the lowland. Coarse materials are spread over fertile fields, roads are washed out or covered with debris, and groves are cut and undermined by locally torrential waters.

The flattish alluvial floor portions of the larger canyons are chiefly parts of extensive ranch holdings. The canyon ranches are essentially country estates, with barred gates and patrolled grounds, and large buildings. The breeding of high-grade livestock, especially saddle horses, is common. In some instances the owners are old-time ranchers, but more commonly they are wealthy persons whose permanent homes are in Los Angeles. As somewhat of an exception to the above-described land-use, the floor of the lower part of Tapo Canyon is devoted to field beans and truck crops, especially tomatoes.

It is pertinent to note, in connection with the land-use of the Simi area, that there is only a general correlation between soil conditions and specific crop production. The recent alluvial and the older alluvial (valley-filling) soils are of prime agricultural importance. The bulk of the crop production is based on them. The often thin residual soils of the less steep parts of the hill country are of little importance for crops, but are of some value for grazing purposes. The rough and stony soil areas are not important from a crop standpoint.[1] They are non-agricultural soils. However, when comparison is made between the distribution of specific soil types and specific crops there are no apparent correlations. Oranges are grown commercially on at least

[1] For nature and value of soils of Simi area, see "Soil survey of the Ventura area, California," U.S.D.A., Bureau of Soils, Washington, 1920 (field operations of 1917); and Weir, W. W., and Storie, R. E., "A rating of California soils," *Bull.* 599, January 1936, U. of Cal., Coll. of Agric., Agric. Exp. Sta., Berkeley (esp. pp. 143–144).

five different soil types. Beans are grown on eight different types. In each case there is no noticeable change as the crop productions sweep across soil type boundaries. Under careful and modern land-use practices it seems that the actual soil type is of little moment. Rather is it such items as slopes, soil depth, air drainage, abundance of irrigation water, etc., that determine the agricultural utility of a given soil area.

The Simi valley is an export area. Nearly all of the harvest is shipped out by truck and train. The walnuts, apricots, oranges, hay, and truck crops all move to markets outside the area. Some of these markets lie nearby, as Los Angeles, but others are scattered widely over the earth's surface. Simi oranges, to take but one example, may be consumed in Chicago or in Paris.

Besides agricultural production, the valley uses portions of its lands and energies for other purposes, some of which are however related to agriculture. In the extreme eastern end of the valley, near the point where the railroad tunnels under the sandstone hills, is a small winery. Nearby is a large and modern chicken and turkey farm. Farther to the north-west is a dairy which serves only valley customers. In the mouth section of Tapo Canyon is an oil field, located along the faulted crest of the Simi anticline, which has been producing steadily since the opening of this century. In the hills north-east of Tapo Canyon is a shell bed, the limey material of which is crushed and shipped out for use as chicken food. And in the south-east is the resort area which has already been noted. Most of the economic elements of the southern California scene are present in the Simi, whether resort or oil field, orange grove or barley field.

On the basis only of past and present trends there is forecast for the Simi a continued elaboration of landscape pattern. In agriculture this development may be halted or slowed down by the lack of sufficient irrigation water. Drainage basins are small and the ground water table is slowly but surely lowering. The eastern portion of the valley floor could be in orange groves to-day if water were not so scarce in that section. There has been talk of tapping the Los Angeles aqueduct, to the north-east. However, between the Simi and the aqueduct lies the high broad bulwark of the Santa Susana Mountains. Would the resultant increased production be capable of paying for the pumping, tunnelling, and piping that would be necessary? Could such high-priced water be afforded when one considers the present cheaper water available in more favoured competing valleys?

Simi crop production is changing. Valencia orange groves are replacing the navel groves. Valencias do not have to meet the stiff competition of the Florida oranges, for they go on the market during Florida's off season. Lemons are also being supplanted by the Valencia orange, possibly because the Simi is slightly too hot and dry during the summer and a little too cold in winter for optimum lemon production. It appears that the Valencia orange, barring some accident of demand, will become king of the Simi crop productions. Furthermore, many old walnut groves have been uprooted in the last three years to make way for oranges and truck crops. Truck acreages are increasing as the Los Angeles plain and other urbanized areas demand more and more fresh and canned vegetables.

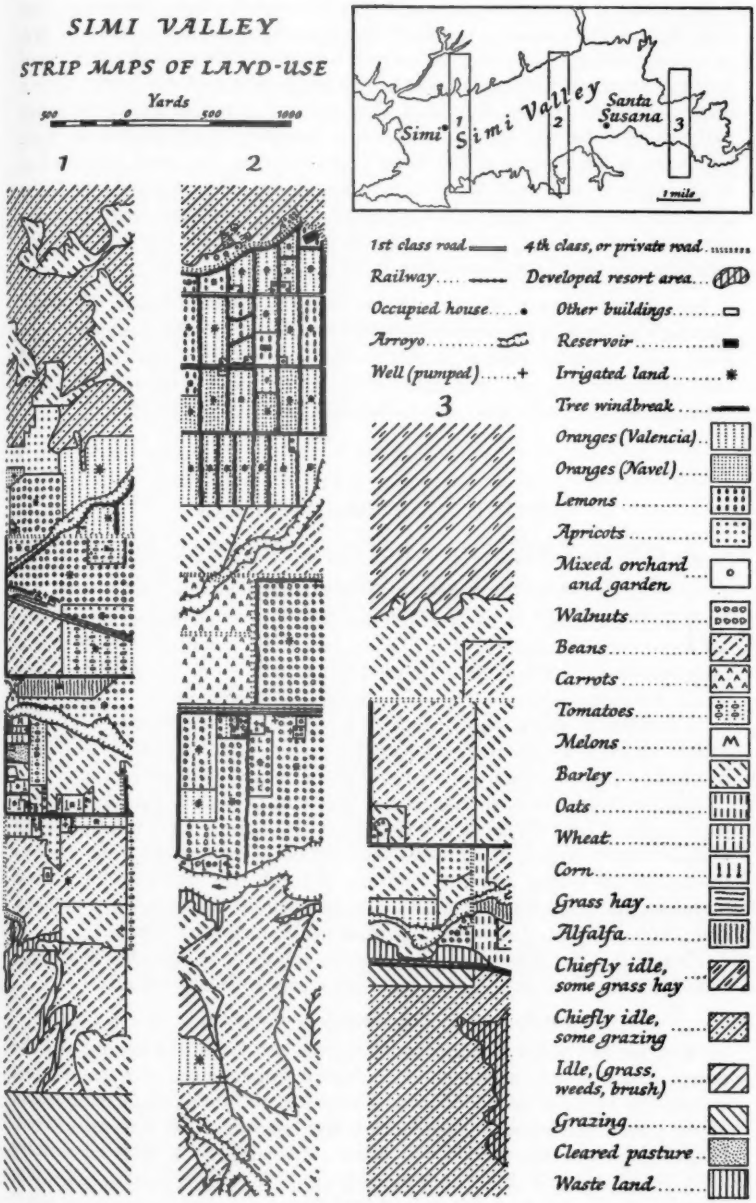

SIMI VALLEY
STRIP MAPS OF LAND-USE
500 0 500 1000 Yards
1
2
3
Simi
Simi Valley
Santa Susana
1 mile
1st class road
4th class, or private road
Railway
Developed resort area
Occupied house
Other buildings
Arroyo
Reservoir
Well (pumped)
Irrigated land
Tree windbreak
Oranges (Valencia)
Oranges (Navel)
Lemons
Apricots
Mixed orchard and garden
Walnuts
Beans
Carrots
Tomatoes
Melons
Barley
Oats
Wheat
Corn
Grass hay
Alfalfa
Chiefly idle, some grass hay
Chiefly idle, some grazing
Idle, (grass, weeds, brush)
Grazing
Cleared pasture
Waste land

Fig. 4

In closing, it is important to realize that although the Simi, like every other area on the earth's surface, is unique to a large degree, yet it is also true that an understanding of its geographical milieu is essentially an understanding of much of southern California between the sea border and the desert. It is a matter of degree, rather than kind. For example, the San Fernando valley to the east is but a larger and somewhat more complex counterpart of the Simi. The same is largely true of the Santa Clara valley to the north and the Las Posas valley to the west. In all cases there is the alluviated piedmont, the chaparral-covered slopes of the adjacent higher land, the long, hot, dry summers and cool, damp winters, the citrus grove and the hay field, and the puzzling mixture of rural and urban forms.[1]

Note by the Editor G.J.—In addition to the maps reproduced, Mr. Glendinning's paper was accompanied by others showing the development of the Simi valley 1900–37 (based in part on the author's field survey), by a soil map of the valley, and by a map of the lesser agricultural and industrial activities in the Simi valley, also based on a field survey of 1937.

FOUR MAP PROJECTIONS

I. A POLAR-AZIMUTHAL RETRO-AZIMUTHAL PROJECTION

COLONEL SIR CHARLES ARDEN-CLOSE, K.B.E., F.R.S.

MR. J. I. CRAIG, who invented the class of retro-azimuthal projections, and first described the class in 1909, gave as an example a retro-azimuthal projection with Mecca as the azimuthal centre, and he made use of meridians which were represented by equidistant parallel straight lines. It may be of some interest to apply the principle to a polar-azimuthal system, *i.e.* one in which straight lines radiate from the pole at their correct angles. If we do this we shall be constructing a polar-azimuthal retro-azimuthal projection.

The method of construction is the following: Select some point on the paper as the pole of the earth, and from this point draw straight lines, radiating at their correct angles, to represent the meridians. Now select some point as the azimuthal centre and the meridian through this point as the central meridian, and place the azimuthal centre at a definite distance, on any chosen scale, from the pole. Let ϕ be the latitude of this azimuthal centre.

Then if A is the azimuth of this centre at any point of latitude λ and longitude L we have, on the spherical assumption, the ordinary formula

$$\cot A = \tan \phi \cos \lambda \operatorname{cosec} L - \sin \lambda \cot L$$

So that for any given latitude and longitude we know the azimuth of the centre, and it is only necessary to draw back from the centre a straight line cutting the meridian at the calculated azimuth, and thus obtain the position on the map of the point of given latitude and longitude. Or, if it is preferred, having calculated the azimuth as above, it is easy by a little elementary

[1] For a more general treatment of the Simi valley, as part of a study embracing all of Ventura County, see Zierer, Clifford M., "The Ventura area of Southern California." *Bull. Geogr. Soc. Phila.*, vol. XXX, No 1, January 1932.

trigonometry to compute the distance on paper of the given point from the pole. Like many projections, it is easy to calculate and to plot, but it is somewhat laborious.

The resulting net-work is rather pretty. An example is given in which the azimuthal centre has been chosen at latitude 45°, which is about that of Ottawa. A hemisphere *can* be shown, but it must be confessed that beyond 90° on each side of the central meridian, the projection is of little use for map-making purposes, for, outside these limits, the meridians cross each other, and the equator curls in comfortably to the pole. But, from equator to pole, and up to 90° on each side of the central meridian, the representation is intelligible and the azimuths can be easily read off. So that we have a serviceable projection for a quarter of the sphere.

The principal meridians, the meridian 90° on each side of it, and the equator are drawn a little heavier.

II. A ROUND-THE-WORLD MAP ON AIRY'S PROJECTION

H. J. Andrews

A radius of 121½° from the centre 55° N., 100° E. includes all the British Dominions excepting the Falkland Islands and the Antarctic Dependencies, and makes therefore an interesting map upon which to plot Empire communications, since round-the-world routes can be shown without interruption. I have plotted the map on Airy's Projection by Balance of Errors as modified by Sir Henry James and Colonel Clarke in the *Philosophical Magazine* for April 1862.

The original was drawn on the scale 1/50M, taking the mean radius of the earth as 6371·2 kilometres, which on the scale of 1/50M is 127·4 millimetres. But upon this projection if the limiting radius is 121½°, the scale at the centre is 0·7246 of the radial scale corresponding to 1/50M, or approximately 1/70M, and this reduced radial scale is very nearly constant over all the central regions of the map, up to 80° from the centre. Hence although the radii were calculated from the Airy-Clarke formula for a scale of 1/50M, the scale of nautical miles attached to the map was calculated for 1/70M on the original and for publication is reduced to 1/140M.

Note by the Editor G. J.—To test the merits of this Round-the-World map we have laid down upon it some of the principal air-routes, in operation or projected, from information kindly supplied by Imperial Airways, Ltd.

III. OBLIQUE CONICAL ORTHOMORPHIC PROJECTION FOR NEW ZEALAND

Lieut.-Colonel J. E. E. Craster, O.B.E.

Three points lying approximately on the median line of the islands were chosen. These were 169° 40′ E., 45° 10′ S.; 173° E., 42° S.; and 175° E., 37° 15′ S. The pole of the small circle passing through these points lies at 157° 42′ 05″ E., 34° 04′ 44″ S. This point was taken as the pole of the projection. The polar distance of the small circle is 14° 23′ 07″. Two small

circles, distant 16° 08′ 07″ and 12° 33′ 07″ respectively from the pole, were chosen as standard parallels for the projection. The scale in the centre of the map is thus made too small by 1 in 2000. Along the small circles distant 16° 55′ and 11° 52′ from the pole the scale is too large by 1 in 2000. Nearly all the land lies between these two circles.

The point 173° E., 42° S. is approximately the centre of gravity of the islands. From this point the errors in bearing of the extreme points of land are:

To point 168° E., 47° 30′ S.	error of bearing	+43″
166° E., 46° 00′ S.		−1′ 39″
178° 30′ E., 37° 30′ S.		−2′ 18″
172° E., 35° 00′ S.		+3′ 47″

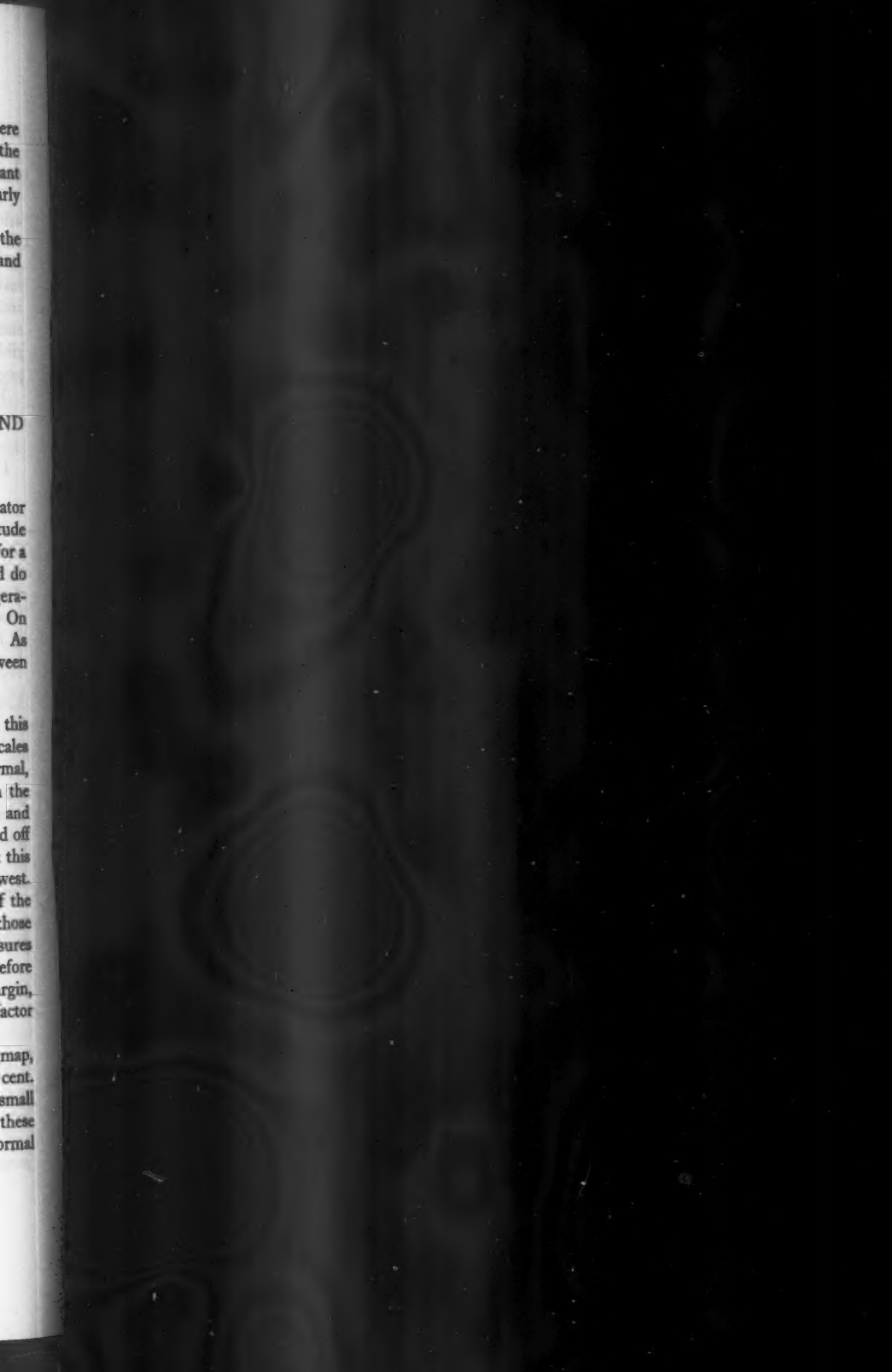
IV. AN OBLIQUE MERCATOR PROJECTION FOR EUROPE AND ASIA

H. J. Andrews

The oblique great circle (in place of the equator) upon which this Mercator projection is based, cuts the meridian 80° E. at right-angles in latitude 40° N. It seems to be better than the conical orthomorphic projection for a map of Europe and Asia, since the meridians do meet at the pole, and do not spread so wide in passing over the equator. India suffers some exaggeration of scale in the south: otherwise it seems to me to make a useful map. On an oblique Mercator the loxodromes are not of course straight lines. As an extreme case I have plotted the loxodrome and the great circle between London and Tokyo.

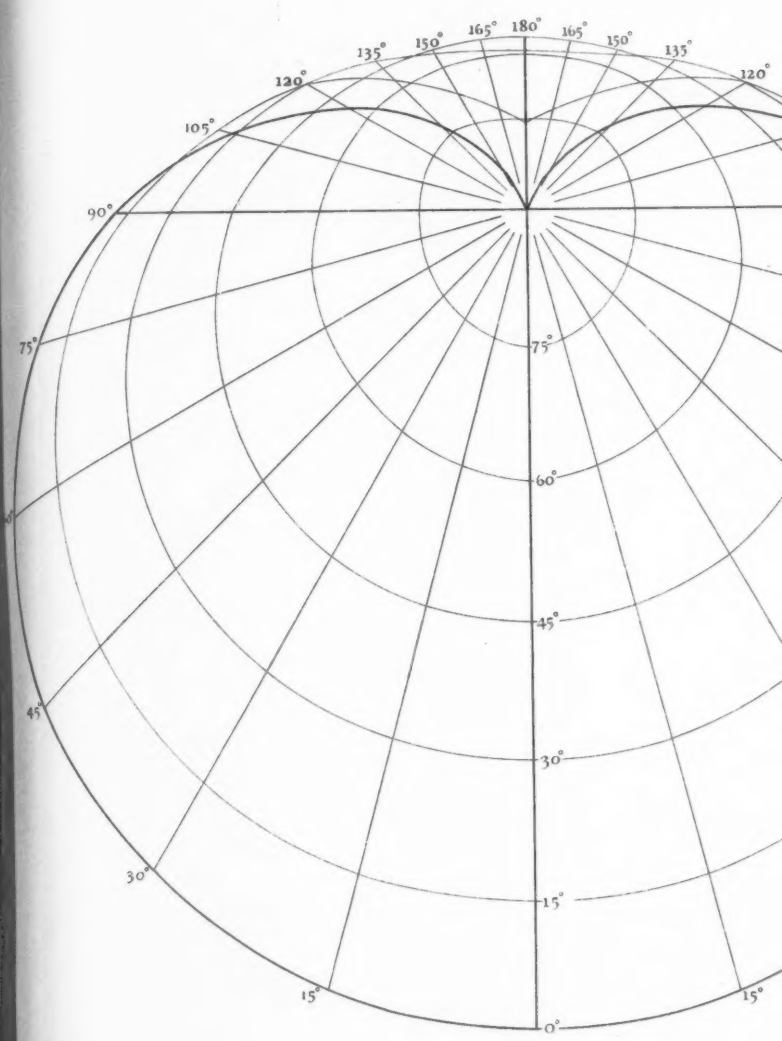
Note by the Editor G.J.—To facilitate measurement of distances upon this interesting projection we have shown experimentally a few devices in scales which may perhaps be found useful in other Mercator projections, normal, transverse, or oblique. The side scales are graduated in degrees from the central horizontal axis (the tangent great circle of the oblique cylinder) and also in statute miles. Distances nearly north and south may be measured off in the usual way from the side scale at the corresponding latitude. But this does not provide for measuring approximately long distances east and west. We have therefore shown at intervals on the side scales the secants of the angular distances from the central axis, which are the scale values at those distances, and the cosines, which are the factors by which horizontal measures on the map are reduced to the scale of the central axis. One may therefore scale off a long horizontal distance upon the scale below the bottom margin, which is the scale for the central horizontal axis, and apply the reduction factor to obtain a rough approximation to the true distance.

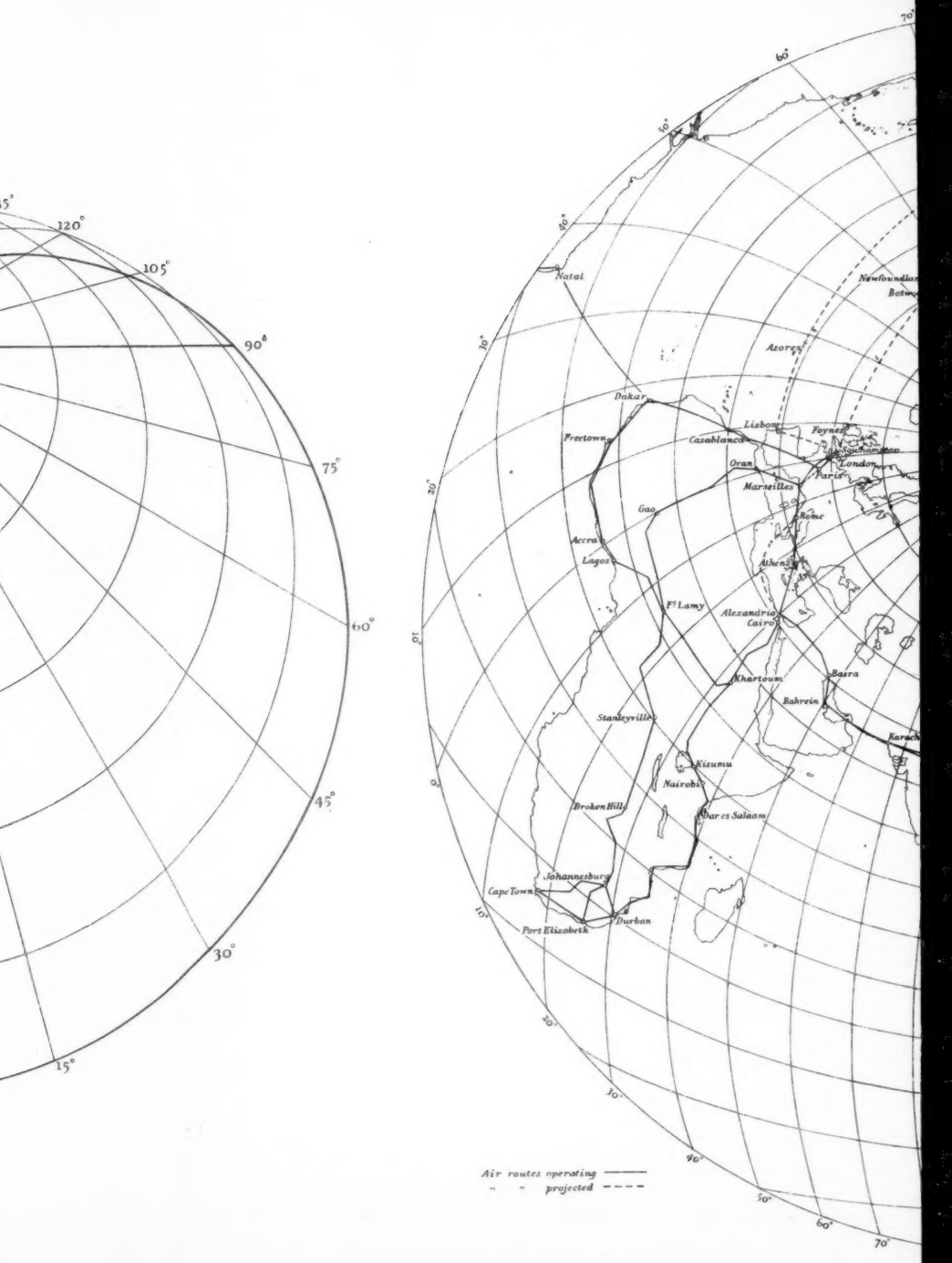
Experiments show that horizontal measures, even right across the map, when thus reduced, are not in extreme cases more than four or five per cent. above the great circle distances. We are in fact measuring the arcs of small circles parallel to the central axis, and since the projection is oblique, these are much nearer the great circle distance than they would be on the normal Mercator projection.



POLAR-AZIMUTHAL RETRO-AZIMUTHAL PROJECTION

Arden-Close





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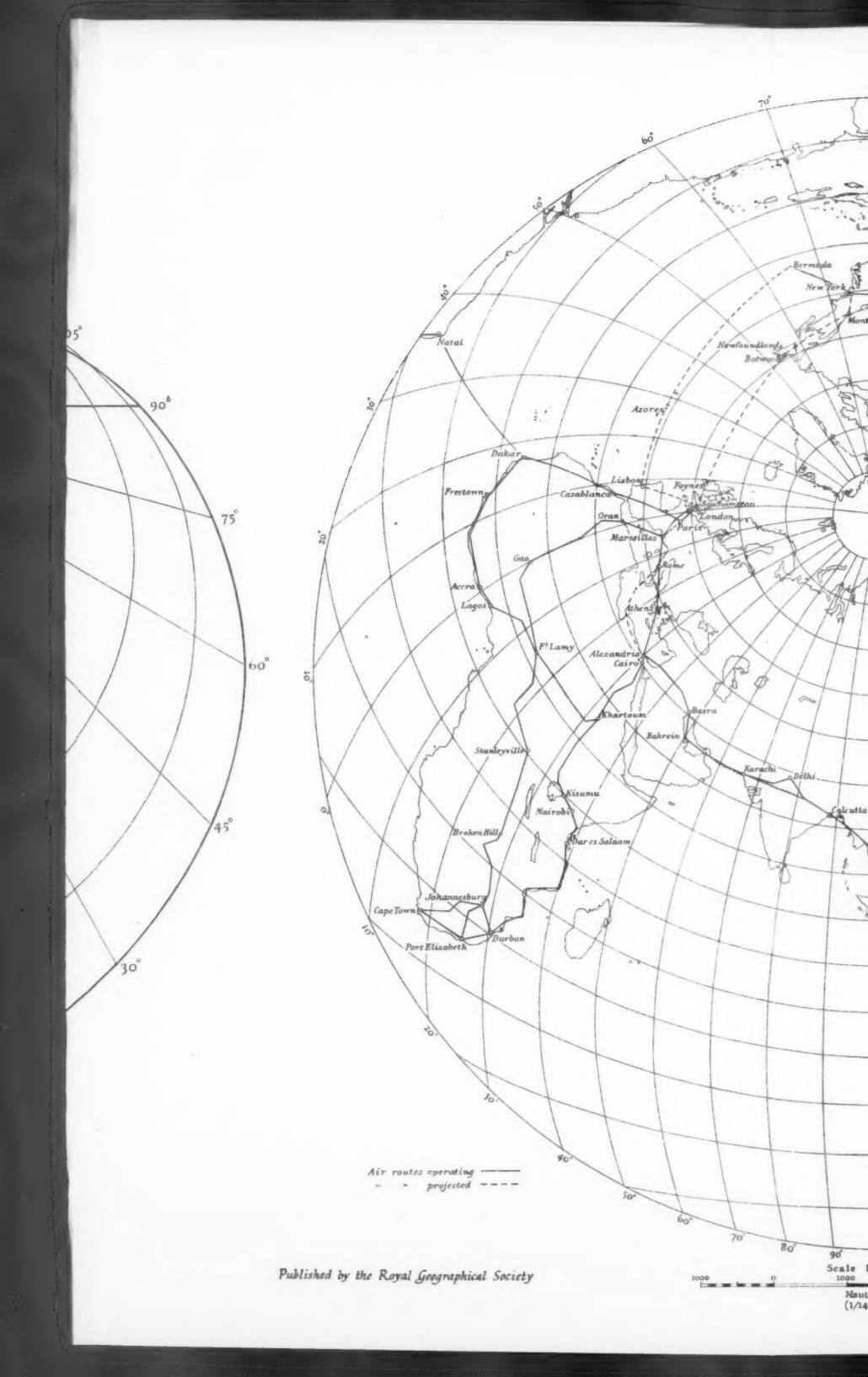
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Rome
Gao
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Khartoum
Basra
Bahrein
Stanleyville
Karachi
Delhi
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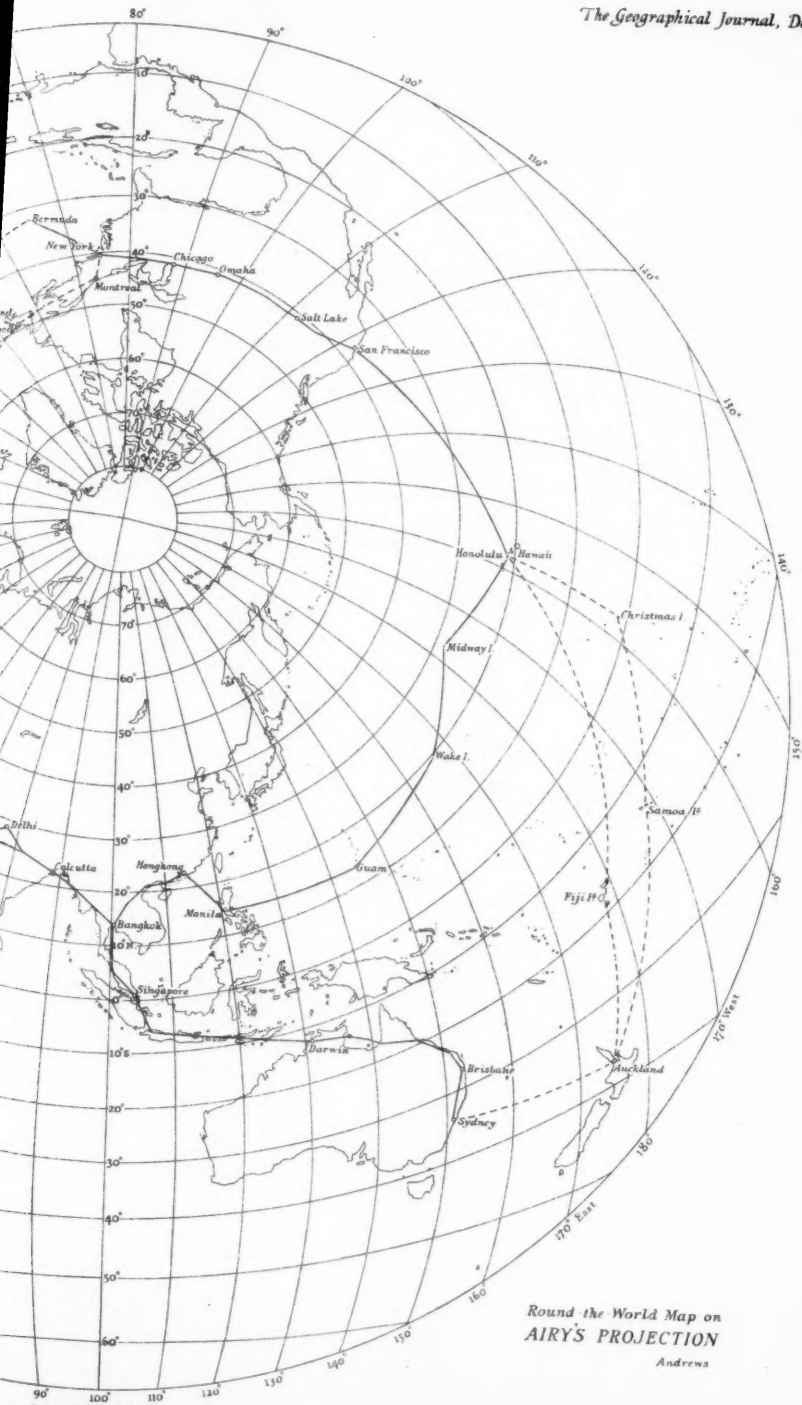
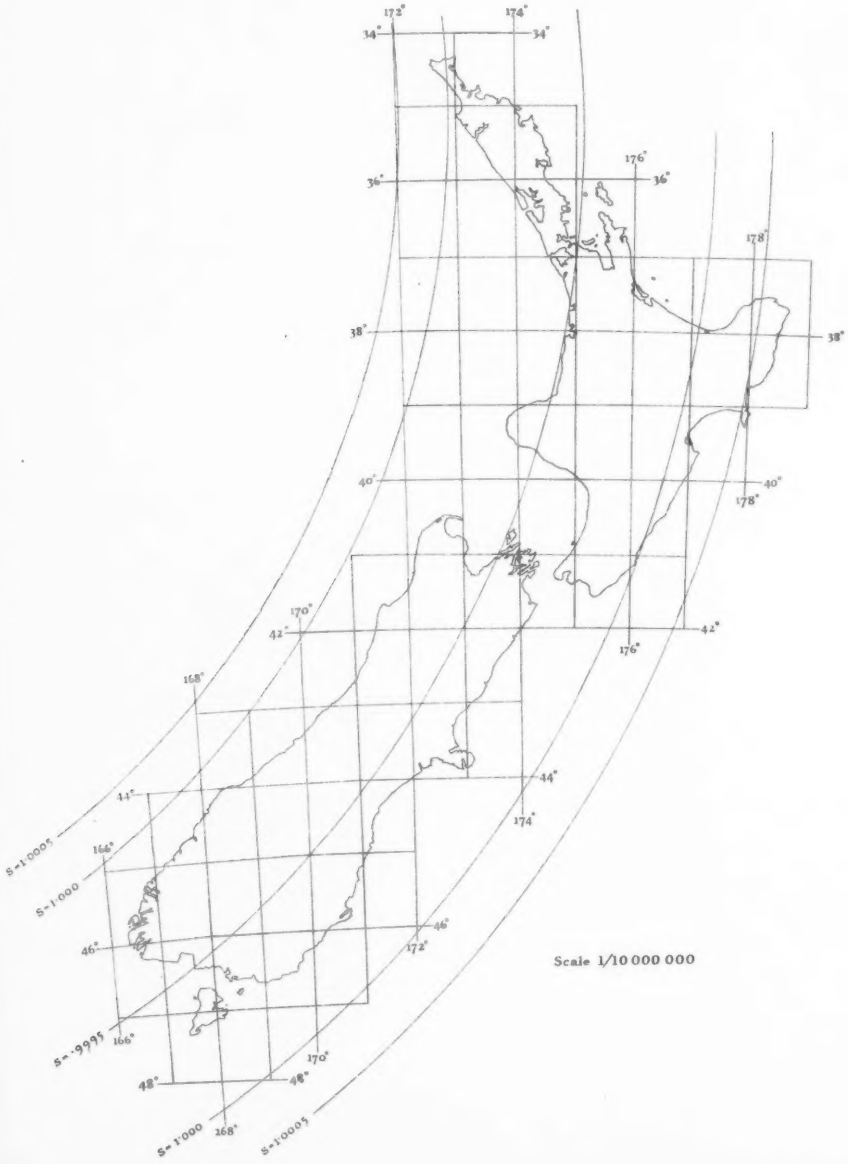


Round the World Map on
AIRY'S PROJECTION
Andrews

Copyright, H. J. Andrews

OBLIQUE CONICAL ORTHOMORPHIC PROJECTION

Craster



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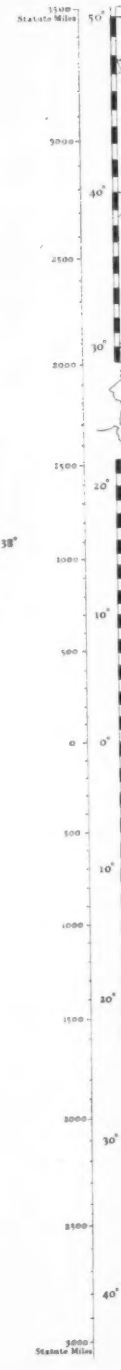

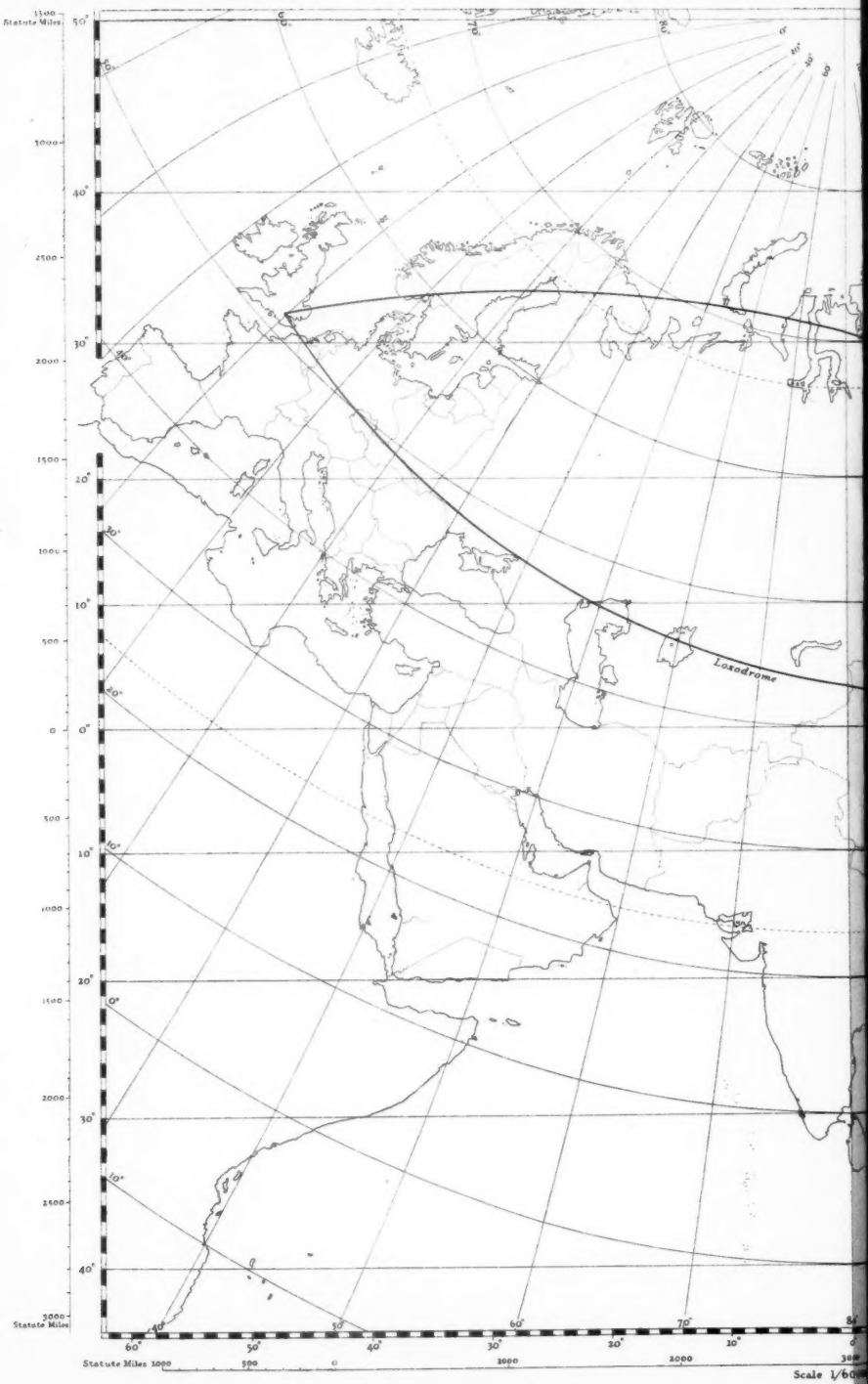
Loxodrome
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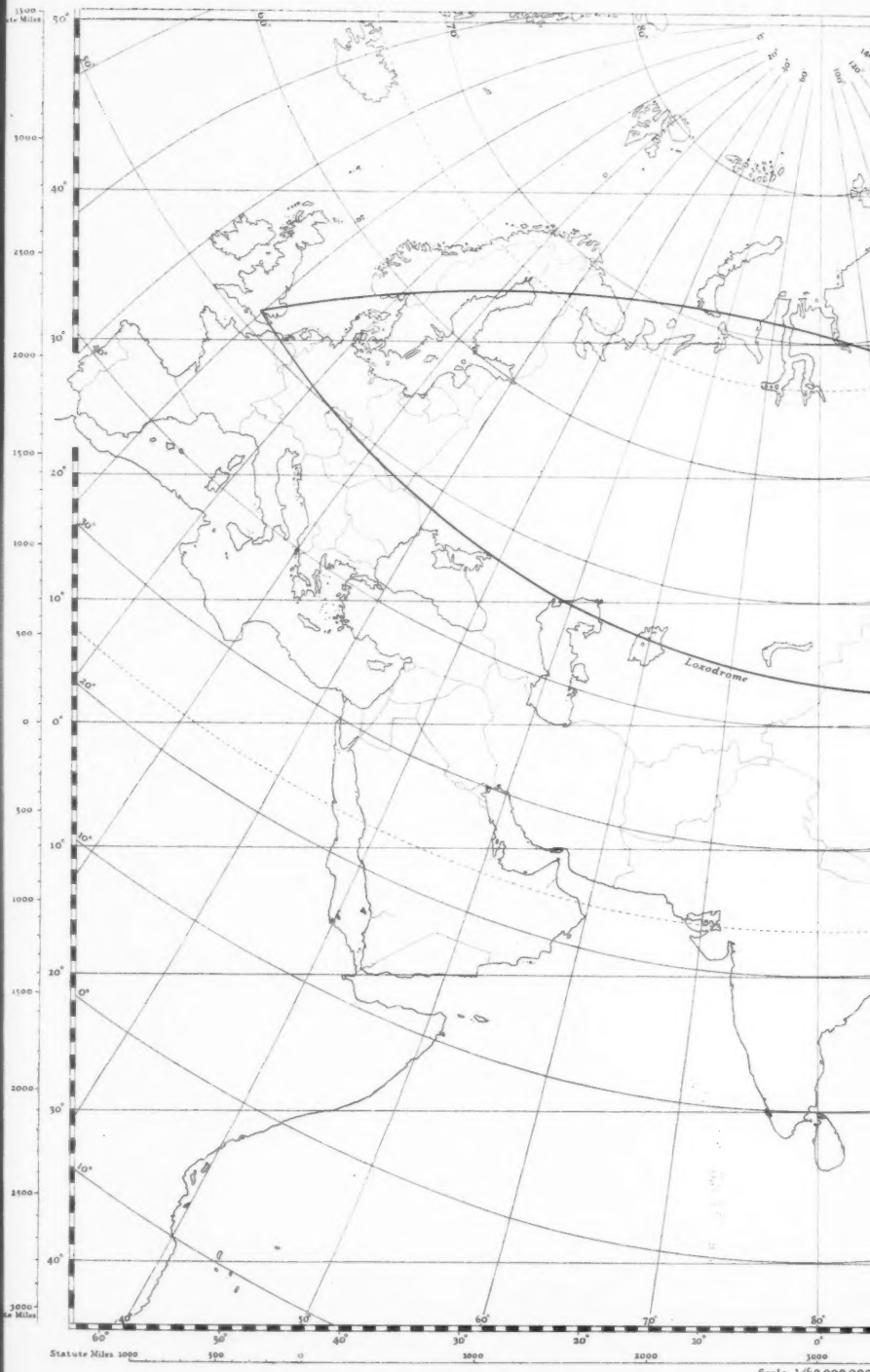
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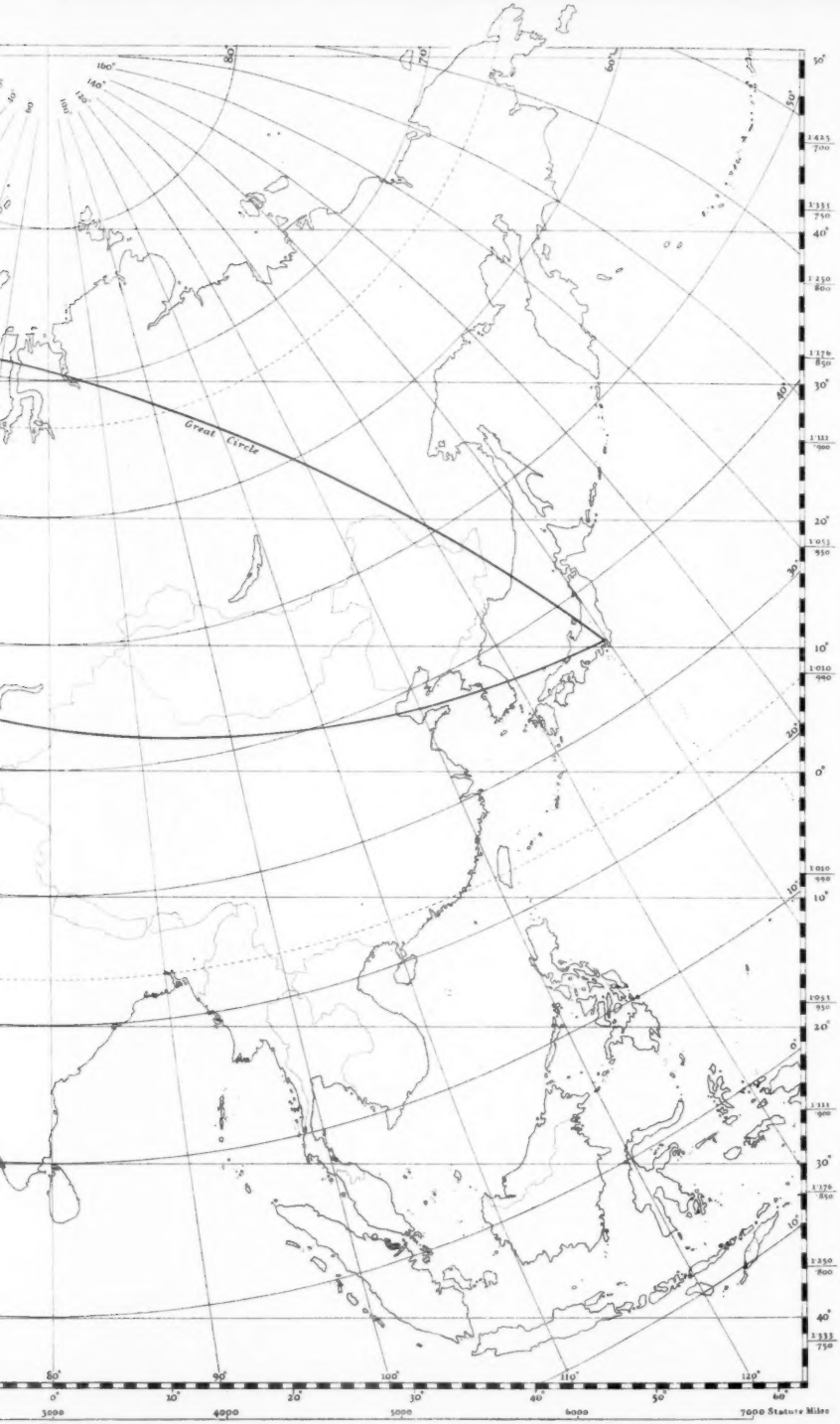

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Andrews: ***OBLIQUE MERCATOR PROJECTION***

FLEMISH NAMES IN BELGIUM

THE simplification of the spelling of Flemish in Belgium, undertaken by the Commission royale de toponymie et de dialectologie (Koninklijke Commissie voor toponymie en dialectologie), and the official recognition of the language, have proceeded together step by step. The new spelling of the names of certain Flemish communes began to appear in brackets after the old in the annual estimates of population published in the *Moniteur Belge* in 1929. The "Loi de classification" of 22 July 1932 distinguished between French, bilingual, and Flemish communes, and established French or Flemish as the official language of particular bilingual communes. A list of the official names of communes was published in the *Moniteur Belge* on 12 August 1932. It was not until 11 June 1937 however that the Belgian Council of Ministers accepted the simplified spelling of Flemish as the official orthography (*a*) for the names of Flemish communes, and (*b*) for the Flemish names of bilingual communes and the communes of Brussels. A list of names in the new orthography was published by the Minister of the Interior on 31 July 1937 ('Spelling van de namen der Vlaamsche gemeenten, van de Vlaamsche namen der tweetalige gemeenten en gemeenten uit de Brusselsche agglomeratie,' 16 pp., Brussel). With respect to Flemish names this list superseded that published in the *Moniteur Belge* in 1932. On 3 September 1937 the Council of Ministers decided that official translations of the names of communes may be used in texts published in the language into which the names are translated. By "official translation" is meant (*a*) with respect to Flemish communes, the bilingual communes, and the communes of Brussels, denomination in the subsidiary language as shown in the list published by the Minister of the Interior in 1937, and (*b*) with respect to all other communes, the denomination in the subsidiary language as shown in the list published in the *Moniteur Belge* in 1932.

A complete list of the official names of Belgian provinces, arrondissements, and communes in accordance with these regulations appears in the "Relevé officiel du chiffre de la population du Royaume à la date du 31 décembre 1937" (*Moniteur Belge*, 11 June 1938). For the official names of geographical features, and of the innumerable villages subordinate to communes, we must await a new edition of the Carte de Belgique, 1 : 100,000 (Inst. Géog. Milit., Bruxelles). Meanwhile, the Flemish names of the more important places and features are available in reformed spelling on a bilingual map by Gheelinck, Lefèvre, and Michotte ("Belgique: Carte oro-hydrographique," 2/M, Turnhout, 1937). The P.C.G.N. has issued a mimeographed list of 260 entries (163 names), showing the more important names now official in Belgium.

From the way in which the names appear in the Belgian lists, it can be inferred that distinction is drawn between places which have (*a*) both French and Flemish names: Bruxelles—Brussel, Meesen—Messines; (*b*) names of which official translations exist in the subsidiary language: Antwerpen (Anvers); (*c*) French names for which there are no Flemish equivalents; (*d*) Flemish names for which there are no French equivalents. Places with both French and Flemish names are few, and are mostly in the Brussels district. In bilingual government publications both names of such places are

evidently to appear, in the order in which they appear in the list published in the *Moniteur Belge* in 1938.

The important differences between the old and the new Flemish orthography, already analysed by Tamss ("Neue Schreibung flämischer Ortsnamen," *Petermanns M.* 77 (1931) 202), are clearly shown by the following examples:

Old	*New*
Aertrycke	Aartrijke
Becelaere	Beselare
Bixchoote	Bikschote
Boesinghe	Boezinge
Cortemarck	Kortemark
Dudzeele	Dudzele
Gheluvelt	Geluveld
Maeseyck	Maaseik
Poelcappelle	Poelkapelle

Comparison of the old with the new spelling, or of the old French with the new Flemish form, offers a guide to the pronunciation of some of the official Flemish names: Reninghelst, for example, used to be called Rening-helst by British troops in Belgium, but the old *gh* was a digraph, and the new spelling indicates Renin-gelst. And now that the Dendre is to be called Dender in Flanders, Dendermonde (*anglice* Dendermouth) appears clearly as ·Dender·mond-e (the dots appearing before stressed syllables), not Den·dermonde, as (*Fr.*) Termonde suggests.

The recognition of Flemish involves the eclipse of a number of familiar names, as, for instance, Alost, Audenarde, Bruges, la Campine, Courtrai, Dixmude, Enghien, la Flandre, Furnes, Louvain, Nieuport, Renaix, Roulers, St.-Trond, Ypres, which become Aalst, Oudenaarde, Brugge, Kempenland, Kortrijk, Diksmuide, Edingen, Vlaanderen, Veurne, Leuven, Nieuwpoort, Ronse, Roeselare, Sint-Truiden, Ieper, respectively. Where translation of terms is involved, some of the new official names have an appearance strikingly different from the old, as in Baarle-Hertog (*Fr.* Baerle-Duc), Geeraardsbergen (Grammont), Leopoldsburg (Bourg-Léopold), Nieuwkerke (Neuve-Eglise), 's-Gravenvoeren (Fouron-le-Comte), Sint-Huibrechts-Lille (Lille-St.-Hubert), etc. It is among the Flemish equivalents of official French names however that the divergence between the two languages is extreme, *e.g.* Bas-Warneton (*Flem.* Neerwaasten), Braine-l'Alleud (Eigenbrakel), Mons (Bergen), Visé (Wezet), Waremme (Borgworm).

The measures of change carried through in Belgium show that the purification of geographical nomenclature has now attained the strength of a movement. Norway is abandoning the Dano-Norwegian spelling of names for more purely Norwegian forms; Albania and Malta have stabilized new systems of orthography; Portugal and South Africa are improving their orthography; Turkey is systematically purging the language of its foreign elements; Catalan is now an official language in Spain; and Greece is insisting on the abandonment of conventional Greek names. The Belgian regulations also foreshadow what is likely to happen in the near future in such countries as Romania which are attempting to solve the problem of minorities. M. A.

THE RE-TRIANGULATION OF GREAT BRITAIN

REPORT OF THE PROGRESS OF THE ORDNANCE SURVEY 1936–37, 1937–38. *London: H.M. Stationery Office*, 1937, 1938. 9½×6 *inches; 34 and 37 pages; maps. 2s; 2s 6d*

THE RE-TRIANGULATION OF GREAT BRITAIN. By Major HOTINE. *Empire Survey Review*. Nos. 25, 26. Vol. IV. 1937

THE chief purpose of the original triangulation of Great Britain was scientific. In the course of the century since it was planned and observed the significance of primary triangulation has changed from the mainly scientific to the mainly practical. In most cases its purpose nowadays is no longer to determine the principal dimensions of the earth, but to provide a rigid control framework for the economic and systematic survey of a large area. Major Hotine's account of the new survey explains very clearly this point of view. He shows how it has arisen in the practical experience of publishing the map of England and how it underlies the idea and methods of the present re-triangulation.

There is no question of the original triangulation, begun in 1783 and completed in 1858, being inadequate for the purposes for which it was intended: in fact the new work has vindicated its ample accuracy to add its contribution to the determination of the spheroid when connected with a sufficient number of astronomical observations. Earlier, the closing of the Salisbury Plain base on the Lough Foyle base, carried out as part of the principal triangulation, agreed with direct measurement to 1 part in 93,000; which, as Major Hotine points out, is very creditable, but may to some extent be accidental. In 1910 a test base was measured in Lossiemouth, in an area remote from either of the original bases. This showed an agreement of 1/60,000, which was satisfactory and showed that the Lough Foyle result might not be so accidental. But modern theoretical criticism of the field and office methods of the older work suggested that local errors might be considerably greater than either of these figures. This would have little effect on the main purpose of determining the figure of the earth, but much on any attempt to secure consistency between blocks of secondary triangulation based on the primary work. And in fact a test made during 1929 in Yorkshire of an area in which such errors might be expected showed that local inaccuracies were present far in excess of the overall error between bases.

The considerations leading to a re-triangulation are nevertheless as much purely practical as based on considerations of accuracy. Too few of the old primary stations can be recovered with certainty, and often they are too far apart for rapid secondary triangulation. In any case if secondary triangulation is to be carried out at all, the cost of a sound primary triangulation on 30-mile sides is, according to Major Hotine, only a fraction of the cost of secondary work on 4-mile sides.

The need of to-day is for maps and plans on national sheet lines. For both civil and military purposes this need has become urgent, with the consequence that the urgency has to some extent dictated the form in which the new triangulation is used as the basis of the new maps. No new astronomical points have been observed, nor has it been considered desirable to compute on a more modern figure of the earth than Airy's. The procedure has been to bring down mean origin, azimuth, and scale for the new system to the old principal triangulation at eleven chosen points by means of a simple adjustment. A possible alternative procedure would have been to have reduced these chosen points first of all to the international spheroid, and it might be argued that the later scientific use

of this excellent triangulation would have been enhanced by such a course of action. As it is, the new work is computed in feet of the old Ordnance Survey standard bar on Airy's figure; and there is no mention of a future programme of astronomical observations. But to prevent confusion later in the matter of scale it was always intended to measure at some time two new base lines in international metres, and one of these, 7 miles long, was measured along the Berkshire Ridgeway between Liddington Castle and Uffington Castle in November 1937. The new work will have its coordinate values preserved from alteration when the results of these measurements are incorporated by adopting a new value for the major axis of Airy's spheroid and a fresh table of scale "errors" for the transverse Mercator projection.

The results will be projected on a single transverse Mercator belt which will provide the coordinates of each point on a national grid, itself serving to correlate all surveys in the country on any scale. A logical development, not yet put forward by the Ordnance Survey, will be to register property in terms of these coordinates.

The angles of the new figures have been observed with the Tavistock geodetic theodolite made by Messrs. Cooke, Troughton, and Simms. The stations themselves are being marked in a solid, permanent, and obvious manner. In this way stations should not become lost, either through natural causes or through unwitting interference. It is intended that these stations should be easily accessible to surveyors in general. The pillar type of mark, carrying a self-centring device on which a theodolite may be stood, is to be erected wherever possible.

Great care has been taken to avoid sites in which subsidence and displacement are caused by extensive mining works. Where a station is of necessity placed in a mining area substitute stations on safe ground have been marked and tied into the main system. But the ruling considerations in the choice of sites for stations have been permanence and ease of access, so that a full use of national triangulation in the future can be assured.

Major Hotine's excellent office routine has helped the new triangulation to progress rapidly; and the adjustment of work done has shown an adequate standard of accuracy in comparison with other modern primary work. In spite of adverse weather the observation of the main chain was completed during the year 1936–37.

Observation of the secondary triangulation has been begun, and at the same time research is being directed towards the further stage, the preparation of control for detail surveys. It is hoped that air photographs can be used to provide this control rapidly and at a reasonable cost. There are of course various ways in which photographs could be used to bridge the intervals between the secondary stations. That chosen by the Ordnance Survey is to carry out a radial line plot by computation from readings taken on a very carefully constructed stereo-comparator, designed by Captain Thompson, R.E., and built by the Cambridge Scientific Instrument Company. It is held that with this instrument the maximum accuracy inherent in the photographs can be extracted quickly and conveniently, provided the photographs are taken from an aeroplane flown by an automatic pilot. The results so far available are very encouraging.

Certainly it seems that air photography in one form or another should give both the control and the detail for the large-scale plans, if these are to be turned out rapidly enough for the requirements of their users. But at least as difficult a problem as the choice of a method of plotting is the development of an organization to take the photographs and handle them rapidly afterwards. M. A. S.

CAMBRIDGESHIRE

THE VICTORIA HISTORY OF THE COUNTY OF CAMBRIDGEshire and the Isle of Ely. Edited by L. F. SALZMAN. Volume I. *London: Published for the University of London Institute of Historical Research by the Oxford University Press*, 1938. $12\frac{1}{4} \times 8\frac{1}{2}$ *inches;* xiv+436 *pages; illustrations and maps.* 63*s* (58*s by subscription for county set*)

THE CAMBRIDGE REGION. Edited by H. C. DARBY. *Cambridge: University Press*, 1938. $9 \times 5\frac{1}{4}$ *inches;* xii+234 *pages; diagrams and maps.* 6*s*

BY the casual traveller Cambridgeshire is often dismissed as a flat and uninteresting county. It is true that it only ranges in height from about 400 feet in the south to a little below sea-level in the Fens, but it is none the less a county of well-marked contrasts and of considerable geographical significance, both from the physical and human points of view. The beginning of the publication of the Victoria County History (to be completed in five volumes) and the meeting of the British Association, for which the handbook here reviewed was compiled, make 1938 a date of importance in the county annals. Furthermore, the fact that so many specialists are available renders these volumes of more than usual value.

A county is geographically unsuited to regional treatment, but the disadvantages arising from this are to some extent offset in these two books. Cambridgeshire consists of four main areas: the chalk and often boulder-clay covered hills in the south and south-east; the Fens in the north and Isle of Ely; the Cam valley which, with its terrace and gravel deposits, conforms generally with the Gault clay; and the plateau between the Cam and the Ouse. Strictly, the Breckland occurs only in Norfolk and Suffolk, but outliers of Breck type are found in the county between Newmarket and Mildenhall, so that it is rightly included in the accounts of the ecology of the county. As so much recent investigation has been carried out in that district it is a pleasure to have summaries of the work in these two volumes, especially as the County Histories of Norfolk and Suffolk are, in this matter, somewhat out of date.

The first volume of the Victoria County History is concerned mainly with the natural history of Cambridgeshire, and also with its pre-history and early history up to and including the Domesday Survey. It follows in general the scheme adopted for other counties. The geology has been edited and largely written by Dr. Dighton Thomas, who took over the task after Professor Marr's death. It is a clear, useful, and comprehensive account, and should be read in conjunction with the short summaries of Fenland stratigraphy which are given in the botanical and archaeological sections. The botany, written by Dr. Godwin, is an admirable chapter. It deals with the subject on an ecological basis, and both expert and non-expert can learn a great deal from it. It is, in fact, rather more than a mere account of what is found in the county. It deals concisely and clearly with plant successions, and the changes that take place in plant habitats. Emphasis is laid on selected districts, *e.g.* Wicken Fen. Although the long account of the zoology of the county, divided into twenty-four sections and written by eighteen authors, is full and informative, it is often in the nature of a catalogue of species so that it becomes primarily a work of reference. Whilst fully recognizing the difficulty of writing even a prefatory general account, possibly on an ecological basis, of the main features of the zoology of the county, it seems a pity nevertheless that it has not been attempted. As a source-book the present account is comprehensive, but to any one who wishes to obtain a

general, even if somewhat non-technical, view of the matter it cannot be said to be particularly helpful.

Dr. Graham Clark, who has worked so extensively in the Fenland, has written a full and interesting chapter on early man, and has clearly related his material to the Pleistocene geology. In this chapter, and also in that on the botany of the county, further interesting details of Fenland geology will be found. The remaining chapters on Anglo-Saxon times and on the Domesday Survey and related problems are full and informative, and enable the reader to get a picture of the county in those days.

The whole volume is a mine of information, and no one reviewer could possibly do justice to it. But it is a pity that no adequate account of the physiography of the county has been given, and one hopes that this may be remedied in one of the forthcoming volumes. It is true that a reader could, by reference to the several sections, piece together a chapter on this subject, but one cannot help feeling that a clear, even if short, general statement would have greatly enhanced the value of the book. It would enable the reader to get a better perspective view of the county and also help him to place the several subjects discussed in their environment. The excellent reproductions of Bartholomew's layered maps (on a 4-miles-to-the-inch scale) help in this, but something more is needed. Cambridgeshire is far from being devoid of geomorphological interest.

The British Association Handbook, edited by Dr. Darby, is necessarily condensed, but at the same time is a valuable production. About thirty-four contributors have taken part in it, and the editor's hand is apparent throughout. By selected footnotes cross-reference is made easy. The information is up to date and concise, but occasionally it is rather too compressed: the account of the Pleistocene deposits of the Cambridge district is almost telegraphic. These deposits, unexciting perhaps, are at the same time of great significance both physiographically and archaeologically.

The first six chapters deal with the natural history of the county, and to some extent may be regarded as shorter versions of those in the Victoria County History. But in several ways they are more up to date, *e.g.* there are brief accounts of the seismic results of measuring the depth of the Palaeozoic floor, and of recent fluctuations of the water-table. Dr. Watt has also analysed the climate of the county. Chapters dealing with place-names, the villages, the nineteenth century, and Cambridge industries introduce the human element. Soils and agriculture are also dealt with. The site and growth of the town are adequately described. The editor has contributed a chapter on the draining of the Fens, and this, with Mr. Borer's summary of modern drainage methods, gives the reader a sound introduction to Fenland problems. The final chapter is devoted to the Breckland, and discusses particularly its general nature, ecology, and afforestation.

The maps and diagrams throughout are clear and good, and without question they are a great asset to the book. Statistics where given are to the point and not too detailed. The geographer will find the volume of great value as most of the separate chapters have a definitely geographical setting. The absence of great detail, whilst possibly rendering the book of less scientific value as a work of reference, has on the other hand allowed the reader to obtain a clear view of the county and its adjacent regions. Furthermore, there are numerous references to more detailed works. In one sense it forms an admirable introduction to the Victoria County History. It was certainly not intended that this should be so, but a reader, specialist or non-specialist in any one subject, will find that it can be used in this way with good effect.

Both volumes are well produced, and the illustrations are excellent. It is a pity that the price of the Victoria County History is so high: it will be beyond the means of many who would like to possess a complete set. It may be added that for the meeting of the British Association a special edition of the quarter-inch geological map of the county was prepared. It is to be hoped that the Cambridge University Press and the editor of the 'Cambridge Region' will see their way to a new edition in a few years' time which will incorporate the work that is still going on in the Fenland, Breckland, and elsewhere. J. A. STEERS.

REVIEWS

EUROPE

THE LAND OF BRITAIN: the report of the Land Utilisation Survey of Britain. Edited by L. DUDLEY STAMP. Part 70. Norfolk. By JOHN E. G. MOSBY. *London: Geographical Publications, Ltd.*, 1938. 11×8½ *inches;* 87–256 *pages; maps and diagrams.* 4*s*

This, the eighth report issued by the Land Utilisation Survey, deals with a county which, from the agricultural point of view, is one of the most important in England. The author however, unlike the authors of more than one of the previous reports, does not forget that the Survey's interests are not entirely agricultural. As a Land Utilisation Survey, one of the chief functions of the county reports should be to emphasize the relationship between the different uses to which the land is or may be put. Dr. Mosby has kept this idea before him throughout, and has produced an invaluable record of land use in Norfolk.

The general arrangement of the Norfolk report is similar to that of the majority of the previous reports. The first main section is an "Outline of the geographical background" and in certain respects is comparatively brief, though not unjustifiably so. Section III, dealing with land utilization in the past, especially in the eighteenth and nineteenth centuries, consists of an historical approach to Section IV, wherein the author discusses the various categories of land utilization in Norfolk to-day. Section V gives an account, illustrated by statistics of typical farms, of the twelve regions into which the county has been divided. The authors of these reports should be as explicit as possible in stating how they have decided on the boundaries of the different land-use regions, and what degree of permanence they believe these to have. The final section is an interesting account of twentieth-century introductions in Norfolk farming, which have had an important effect upon land use.

True to the avowed aim of the Survey to be a modern 'Domesday,' the author of the Norfolk report supplies us with a wealth of information relevant to land use in the county; but as an almost unavoidable result of being so detailed, conciseness and readability are occasionally sacrificed. F. H. W. G.

MODERN GEOGRAPHY. Book II. The British Isles. By D. M. PREECE and H. R. B. WOOD. *London: University Tutorial Press*, 1938. 8¼×5½ *inches;* viii+300 *pages; illustrations and maps.* 3*s* 6*d*

This is the second of a series of six books designed for pupils preparing for the School Certificate Examination. The preface does not state at what age this particular book is intended to be used, but the matter and style would seem to place it quite late in the pupils' course. There are few good text-books devoted solely to the British Isles for use in secondary schools, and this book fills, quite

effectively, the gap which exists between books prepared for the first year or two of the secondary school course and the university text-book. The information is on the whole accurate, with some exceptions noted below; the style is concise and readable; and the selection of maps and pictures especially praiseworthy. The numerous sketch-maps are clear and to the point.

The authors are sometimes a little hazy on geological matters. It is disappointing to find the obsolete term "New Red Sandstone" used for the whole Triassic series: it makes it so much more difficult to give pupils an idea of the great marl plains, and it leads to false impressions about the source of the salt deposits, for example, and about the correlation with cattle pastures. Likewise one may continue to regret the application of the term "oolitic limestone" to the whole of the Jurassic scarpland belt. The statement that the North York Moors are composed of limestone (p. 110) is a little unfortunate, when only a few lines lower down the vegetation is described as "heather and coarse grass."

The amount of detail given for the various regions into which Britain is divided is so great that omissions become all the more obvious. The Peterborough and Bedford bricks are not mentioned at all in the section on the Clay Vale (though one of the authors comes from Luton, which has two-thirds of a page all to itself); and the great iron pipe industry of Chesterfield and Ilkeston, rivalled only by that of Lorraine, is omitted. It is surprising, too, to find no reference, either in the text or on the appropriate map, to the important hydro-electric power stations of Galloway, when all the others of note, and some much smaller, are included.

Of the out-of-date statements the following may be noted: Swansea smelts copper ores (p. 74); Stockton is an iron-smelting centre (p. 94); a tunnel is being constructed under Ben Nevis (p. 245). There are substitutions (unfortunate in a school text-book) of westward for eastward, or *vice versa*, on pp. 10, 79, and 172; and on p. 11, "acid" should be read as "basic." The information on canals is a little shaky at times. Thus on p. 60 the Kennet and Avon is erroneously referred to as the Thames and Avon, and on p. 211 it is stated that the Thames and Severn is still functioning, whereas the Cotswold watershed section of this canal has been derelict for a great many years. It is nonsense, too, to say that the Trent and Mersey canal "connects Liverpool with Hull" (p. 211). The statement on p. 82 that "the movement of sheep from summer to winter pastures is known as 'transhumance' " will hardly represent most teachers' ideas of the meaning of this rather abused term, especially when applied to Kent. A common fallacy that ships can be built with iron ore is repeated on p. 260, where Belfast, which has never seen a blast furnace, is said to import such ore from Ayrshire for its industry. On p. 232 Clydebank and Clydeside are confused.

These blemishes are recorded here in the hope that the authors and the teachers and pupils who use the book may be enabled to correct them. They do not detract greatly from the value of the book, which is considerable.

S. H. B.

THE RISE OF THE MIDLAND INDUSTRIES, 1600–1838. By W. H. B. COURT. *London: Oxford University Press*, 1938. 9×5½ *inches;* viii+272 *pages.* 15*s*

It has been recognized for some time that the industrial changes of the late eighteenth and early nineteenth centuries were only the culmination of a movement begun long before. Recent work, particularly by Professor Nef, has shown the development of English industry in Tudor and Stuart times. The present study has to be read against the background of such work, for it is a survey of the

industrialization of the Midland counties of Shropshire, Staffordshire, Warwickshire, and Worcestershire from the Stuarts to the eighteen-thirties. Mr. Court tells how, during those centuries, the life of that region became increasingly dependent on its mineral resources. He traces the development of the coal and iron industries, showing them to have been highly capitalistic at an early date. Upon coal and iron was built the Midland metal industry, of which the making of nails was the most important branch. There is an excellent account of the nail industry which remained on a domestic basis until the coming of the machine-made nail in the nineteenth century, when the nailers suffered a fate similar to that of the handloom weavers faced by the power loom. Like so much domestic manufacture, the nail industry was controlled by the capitalist *entrepreneur* who was able to meet the increasing demands of the market by expanding domestic production and not by concentrating workers in factories. Other industries satisfied the market demand by an organization different from this. In the chemical industry, for example, the factory arose "genie-like, out of the fumes of the laboratory." Such factories were symbolized by James Keir's Tipton works. Glass making, too, which was introduced into the Midlands by Huguenot capital and skill, was carried on in "glass houses" which were necessarily of a non-domestic nature. All this industrialization implies a decline in the relative importance of agriculture, but Mr. Court shows how closely the industrial and agricultural interests were connected. Industrial capitalism did not grow "upon the ruins of feudalism, but in the interstices of the older society."

This is but one of the interesting points made in this valuable study of an important area during an important period. In the nature of things such a study could not be exhaustive, but more might have been said about transport and the actual organization by which the market was supplied. There is little on communications except one slight chapter and some incidental references. The importance of the local, London, and American markets is emphasized but it is not easy to trace how they were actually supplied. This aspect of economic history rarely receives the attention it deserves, perhaps because information on it is difficult to obtain, but something might have been gained by the use, for example, of the Gloucester Port Books, which record shipments of goods coming originally from the Midlands. Finally, as in most regional studies, a map would have been helpful. T. S. W.

THE PLACE-NAMES OF HERTFORDSHIRE. By J. E. B. GOVER, ALLEN MAWER, and F. M. STENTON. (English Place-Name Society. Vol. XV. General Editors: A. MAWER and F. M. STENTON.) *Cambridge: University Press*, 1938. 9×5½ *inches;* xliv+342 *pages; maps.* 18*s*

In this work the authors have made use of the usual printed and manuscript sources and muniments of the county, Westminster Abbey, St. Paul's Cathedral, and several Cambridge colleges, with assistance from various local authorities and helpers.

This study of place-names throws interesting light on the early occupation of Hertfordshire, a county whose boundaries are among the most artificial in south England, and whose natural features are reflected in the place-name elements. The contrast between the chalk downland in the north of the county and the wooded claylands of the south-east is indicated by Old English elements, such as "dell," meaning a little valley and found in the chalk district where there is also an absence of elements suggesting surface water, and "leah," showing wooded land everywhere except in the north-eastern part bordering Cambridgeshire. The frequent occurrence of "Chalk Dell" is a reminder of the

former agricultural practice in the "clay with flints" areas, in which pits were sunk to supply chalk for lightening the surface soil. The wooded country, where scattered hamlets in clearings were the rule, must have offered resistance to invasions, and the evidence of place-names, supported by that of archaeology, suggests that the British occupation of Hertfordshire continued some time after the first Anglo-Saxon invasion of the country.

The authors conclude that Hertfordshire, showing traces of having included two early Anglo-Saxon kingdoms, probably formed part of Essex in the east, while the rest of the county belonged to the Middle Anglian provinces. In the district round Hitchin there is evidence that the invaders came from the north-east in names associated with tribes known to have existed there. The county is not mentioned by name until the eleventh century, but was probably formed one hundred years earlier in the reorganization of the eastern midlands by Edward, King of Wessex. The rarity of Scandinavian elements shows that though the county was under the Dane law it was never intensively occupied by Danes, while Norman-French influence has been slight. There are more medieval and post-medieval names.

The book includes a list of place-name elements and several useful maps, one of parishes and hundreds of the county, and others showing the distribution of the more significant elements. The authors have also printed addenda and corrigenda to previous volumes of the series. O. J. P.

DIE BAUERLICHE SIEDLUNG DES RAVENSBERGER LANDES bis 1770. By HANS RIEPENHAUSEN. (Arbeiten der Geogr. Kommission im Provinzialinstitut für Westfäl. Landes- u. Volkskunde, I.) *Münster: Franz Coppenrath*, 1938. $11\frac{1}{2} \times 8$ *inches;* iv+144 *pages; maps and sketch-maps. RM.*7.50

This first monograph of a new series of publications is a study in the historical geography of rural settlement. The area selected lies in the extreme north-east of Westphalia, in the hill country of the Weser, and between Bielefeld and Minden. The author's method has been made familiar in many papers and monographs dealing with other parts of Germany. For the sake of completeness a summary of archaeological finds is given; but the chief instruments of analysis are place-name study (including field names as well as village names), and the classification of settlements—the study of maps revealing three types of villages (*Haufendörfer* greatly predominating) as well as scattered and clustered farms. Some further evidence is provided by the arrangement and form of strips in the open fields, the oldest fields (*Eschfluren*) being distinguishable by their lengthy irregular strips. Thus a coherent picture of the process of settlement is pieced together. The village communities of the valleys are representative of the type so widespread in Central Germany. The scattered and mixed forms of the hills seem to have developed from a primary village settlement through the policy of landowners in late medieval times, though this problem proved the most difficult of the whole investigation, and it cannot be said that all the issues raised are conclusively settled. J. H. G. L.

IN CZECHOSLOVAKIA'S HINTERLAND. By HENRY BAERLEIN. *London: Hutchinson and Co.*, 1938. $9 \times 5\frac{1}{2}$ *inches;* 288 *pages; illustrations.* 12*s* 6*d*

Czechoslovakia's hinterland is Ruthenia, and the title was chosen on the assumption that most people do not know where that province is. The reader is not troubled with a map, and place-names are reduced to a minimum. Mr. Baerlein evidently began his tours from Užhorod, and at one time seems to have approached the Romanian frontier: the vagueness is deliberate, for he feels that others may want to have the joy of exploring for themselves a delightful

and little-known countryside. That countryside however is revealed only by the many and excellent illustrations, for the text is taken up by dialogue which on occasion ranges far from Ruthenia. The reader may be beguiled by Mr. Baerlein's conversational manner, but it must be admitted that the curiously stilted style sometimes palls; and the propaganda, mild though it is, is obvious enough to be irritating. Of the province itself, with its forest wealth, its agricultural problems, its various races, languages, and creeds, only a vague impression remains. Mr. Baerlein was very much alive to the many aspects of its life; his methods of travel brought him into close contact with its people. Somehow it seems a pity that his picture has not assumed more definite contours.

J. P. H. M.

ASIA

PALESTINE UNVEILED. By DOUGLAS V. DUFF. *London: Blackie and Son, Ltd.*, 1938. 8×5½ *inches;* x+242 *pages; illustrations and sketch-map.* 8*s* 6*d*

The author claims that the journey to Palestine here described was made not by himself but by a friend, a Dorset farmer. The traveller had never been abroad before, but had prepared himself by careful reading for much of what he was to find in the Holy Land. He approached Palestine from the south, went north by Lydda and Haifa as far as Meirun, and returned to Jerusalem by Nablus. Despite the somewhat sensational title, the traveller's account of what he saw is couched in sober language, and tinged by obvious regret at the state in which he found the country; it is worth reading for its impartiality.

SIND'S CHANGING MAP. An album containing 51 old and rare maps of Sind with critical and explanatory notes on them. Collected by M. B. PITHAWALLA. *Published by the author, Victoria Road, Karachi*, 1938. 14×9 *inches. Rs.*2/8

This album of fifty-one maps of Sind, a series dating from the second to the twentieth century, forms part of Professor Pithawalla's 'Historical geography of Sind' on which he has been at work for several years. The 'Historical geography' is a sequel to the author's 'Geographical analysis of the lower Indus basin' which has already received notice in this *Journal* (90 (1937) 285–6). Both the geographical and the historical memoirs are necessarily mainly works of compilation, for the material available must be assembled before it can be analysed and interpreted, and taken together they represent a laborious and patient effort which must command respect. No doubt at a later stage Professor Pithawalla will be able to review his whole work in due perspective and it is much to be hoped that scholars will be found among his fellow countrymen to assist him by attacking those problems which require specialist knowledge in other than the geographical sciences for their solution.

The maps in the Album under review are reproduced in clear outline in black and white. Ptolemy's map of the Indus is of course the earliest, and is followed by a number of Arabic maps, taken from Muller's 'Mappae Arabicae.' Then follows a selection of sixteenth and seventeenth-century maps, including William Baffin's of 1619, after which the author prints outline copies of the several series of maps found in the works of modern writers upon Sind, notably those of J. Abbott, W. Vincent, and Major Raverty, together with transcripts of modern surveys at different dates. As so often happens, the inclusion of hypothetical reconstructions side by side with authentic maps is likely to confuse the reader, and although each sketch-map is the subject of a brief descriptive

or explanatory note, the distinction between the two types of map is not always made quite clear. That the Indus Basin region is of very great geographical and historical interest will be generally agreed, and as the author remarks in his General Note, while presenting in detail an extraordinary picture of instability and change, both physical and human, the Indus in its broader aspects, in its division into delta and valley, and in its function as a major focus of settlement and gateway of India, has preserved its character and individuality throughout the ages. E. G. R. T.

NADIR SHAH. By L. LOCKHART. *London: Luzac and Co.*, 1938. 10×7½ *inches;* xvi+344 *pages; illustrations and maps.* 21*s*

Dr. Lockhart's monograph deals with one of the most brutal and successful of those catastrophic personalities which have from time to time emerged in the land of Iran. The author has borrowed few of the arts of Lytton Strachey and his school, for every statement is securely anchored to original authorities, yet the history, like that of all such prodigies, makes interesting reading. True he relegates mainly to footnotes the stories commonly told of Nādir Shāh, those of his hideous cruelties and those more romantic ones telling how he carried off the Peacock Throne from Delhi and how he provided a link in the chain of events which brought the Koh-i-Noor diamond from India to the Imperial Crown of Britain. Yet we are shown stage by stage how this strange individual, born of poor peasant folk in northern Khurāsān made himself lord of his native land and of half India as well. The list of authorities used is an impressive one, manuscript and printed sources in most of the languages of the Islamic world and of Europe having been carefully read and pressed into service. From the scholar's point of view the last word has been said on the subject and the following criticism is only concerned with the vexed question of transliteration. Even the expert does not always know how a proper name is spelt in the original; *e.g.* "Nasir" may be read either as "Nāsir" or as "Nasīr," and it would have been of considerable help if Dr. Lockhart had marked at any rate the long vowels. To the general reader such a name as "Khudayar" (*i.e.* "Khudāyār") must be a puzzle, and it is curious to read that "Sam emerged from his hiding place" (p. 239), the reference being to Sām Mīrzā. A good index and some useful maps complete this excellent piece of work. R. L.

BLACK RIVER OF TIBET. By JOHN HANBURY-TRACY. *London: Frederick Muller*, 1938. 8½×5½ *inches;* xii+306 *pages; illustrations and route-map.* 12*s* 6*d*

This book gives an admirable account of the exploration of some practically unknown areas of south-eastern Tibet by Ronald Kaulback and John Hanbury-Tracy. Kaulback had already visited the more southern parts of the area in question in company with Kingdon Ward in 1933, and Hanbury-Tracy, although he had not been in Tibet before, was an experienced traveller; and between them they possessed all the best qualifications for their task: youth, energy, experience, a good working knowledge of surveying and of the sciences of botany and zoology, and, above all, tact and a sense of humour. As might be expected the results of their expedition are of great practical value. Between them (for at times they separated and worked on different routes) they covered 3000 miles of route and mapped some 25,000 square miles of almost entirely unexplored country; and they brought back a collection of plants and insects, many rare, and some new to science.

Starting from Burma they reached the Tibetan frontier at the headwaters of the Irrawaddy and crossed into Za-yul. Thence, working northwards, they

traversed the whole length of the district of Po-tö (Upper Po-yul) emerging into the province of Kham, their main objective being to reach the source of the Mekong (the Nak-po Chu or Black River of the book's title). They were well on their way to this when they were unfortunately stopped by a suspicious Dzong-pen who held them in virtual captivity for nearly three months while he communicated with Lhasa.

This long delay upset their plans, and from this spot they were obliged to abandon their main objective and to turn east and south again. But the return journey was not wasted, as they travelled by a different route and continued their survey and their collections over large unexplored areas, until after nearly two years' wandering, they emerged by the course of the Lohit river into Assam near Sadiya.

Mr. Hanbury-Tracy's book is charmingly written, and he gives vivid sketches of the servants, the native inhabitants, and of the more sophisticated officials who are deputed from Lhasa to govern these outlying parts of Tibet. And he includes some dramatic descriptions of the physical features of those areas where the great Tibetan rivers, turning south, have scoured for themselves vast troughs bounded on either side by almost precipitous mountains.

Mr. Hanbury-Tracy has, in fact, produced a most interesting book of travel which describes a little-known country and people in a pleasant and readable form. There are numerous illustrations and a sketch-map on the cover.

F. O'C.

SOCIAL PATHOLOGY IN CHINA. By HERBERT DAY LAMSON. *Shanghai: The Commercial Press*, 1934. 9×6 *inches;* xviii+608 *pages*. $4

This unpretentious but valuable work is so pertinent to the understanding of many aspects of the situation in China that the delay in reviewing it may not be without advantage if it calls attention to what is rightly described in the Foreword as "a source book for the study of fundamental social problems, such as livelihood, health, and the family, as they exist in China to-day." This Foreword was contributed by the late Dr. Herman C. Liu, and both he and the University of Shanghai, of which he was the distinguished President, have been among the victims of the present conflict. As Professor of Sociology in the same University Mr. Lamson had for many years collected and analysed the data presented in this book, which is primarily intended for Chinese students and social workers. This fact determines its form and arrangement, but at the same time it is of great value to Western readers who wish to understand those basic social and economic problems which condition the present struggle and the whole outlook for China, whatever the issue of that struggle may be. It is comprehensive, well balanced, and illuminating, and, while it is encyclopaedic in character, the different parts are so well inter-related that the whole forms a coherent picture. The summaries are particularly useful, such as that which evaluates in Chapter V the conditions favourable and unfavourable to Chinese industrial development. From this and similar analyses in other parts of the book it is clear that the majority of the barriers to Chinese economic and social progress are removable and in many cases have in fact begun to yield to the efforts of reformers. Mr. Lamson has a strong belief in the fine qualities, vitality, and resilience of the Chinese people, but he does not minimize the gravity and magnitude of the problems which confront them, and these are set out clearly and concisely, with adequate illustration and careful documentation.

About one-half of the book is concerned with the related problems of over-population, standard of comfort, and health of the people. The author finds the root-cause of rural poverty and unrest in overpopulation rather than in the

agrarian economic system, as is strongly indicated by the fact that poverty is considerably more acute in the Northern Plain than in the Yang-tze valley, although peasant proprietorship is far more dominant in the former than in the latter.

Part III of Mr. Lamson's book deals very judiciously with the great problem of the reconstruction of the family, which epitomizes China's need for reconstituting her social system without destroying the solid foundations on which it has so long rested, and which raises the whole question of the extent to which Western concepts and modes of life can be selected, adapted, and assimilated without essential loss of vitality. The author's view of China's future is indicated in one of his final sentences: "There is a racial and cultural virility here which, if wisely guided and released from the heavy weights which now oppress it, may be depended upon to raise China to her rightful place among the societies of the earth." P. M. R.

AFRICA

A VICARIOUS TRIP TO THE BARBARY COAST. By MARY BERENSON. *London: Constable and Co.*, 1938. 9×6 *inches;* viii+146 *pages; illustrations and sketch-map.* 7*s* 6*d*

In the words of the authoress the intention of this book is "purely aesthetic and touristic." The text is partly excerpts from the letters sent by her husband and some friends to the authoress, who was prevented by illness from accompanying them, and which contain accounts of the personal reactions to places they had not previously visited, along with much of the detail of the daily round of several archaeologically and art-minded people during a journey in Tripolitania. For the rest, the text includes literary gleanings by the authoress, who was stimulated to read much relevant material, and a considerable amount of the comment one would tend to expect from a sensitive woman, well read in classical literature and with a leaning to art and literature in general. The book makes pleasant reading, and contains excellent photographs of the statuary, mosaics, and ruined buildings of classical Greek and Roman civilization in the parts visited, as well as of present-day native and Italian life there. The real journey occupied a little over a month in the spring of 1935, and was from Naples to Tripoli with excursions to Leptis Magna and Ghadames, and then to Benghazi, with a visit to Cyrene and other places on the way. W. F.

ART RUPESTRE AU HOGGAR (HAUT MERTOUTEK). By F. DE CHASSELOUP LAUBAT. *Paris: Librairie Plon*, 1938. 9½×7 *inches;* iv+64 *pages; illustrations, drawings by* GEORGE AROUTUNOFF, *and sketch-maps*

This little work is of very considerable importance to all students interested in the rock-shelter art of northern Africa. The author expressly states that he is an explorer rather than a scientific archaeological investigator, but he has succeeded in compiling a volume which will be of permanent interest. The sites mostly occur in the gorges of the Oued Mertoutek, which open in the granite massif of Tefedest. They consist of rock shelters hollowed in this granite, or formed by overhanging boulders upon the sloping sides of which are groups of engravings and paintings. A map is given which shows at once the general situation. It covers part of the area enclosed between latitudes 22° and 26° N. and longitudes 4° and 8° E.: a mountainous region almost in the middle of the great Sahara to the south of Algeria. The rock shelters fall into three groups, at three different altitudes: low, middle, and upper. The low-level group has yielded both engravings and one set of paintings, and these differ in style completely from the art seen in the rock shelters of the middle and upper groups,

where, moreover, only paintings have been discovered. The engravings are found on flat surfaces, clearly visible. Some have been made by the pocking, others by the true engraving technique.

After describing the situation and general considerations, a detailed description of the finds at the various sites is given. These chapters are profusely illustrated, and the author is to be congratulated for having put on permanent record so much valuable material. Some of his plates consist of long folders in colour, and a certain number of actual photographs are reproduced below the coloured reproduction of the frieze as a whole. Thus it is possible to check the tracings against actual photographs—an excellent system. When one considers the number of illustrations, many of them in colour, the moderate price of the book is astonishing.

The paintings and engravings of the low-level sites are probably not very old. Horsemen are depicted and, as a whole, the paintings resemble the latest Bushman art in South Africa. The engravings, too, are like the North African examples of probably no great antiquity which have been figured by Frobenius and others. The paintings in the sites of the middle and upper altitudes, at about 1880 m. and 2075 m. respectively, are far superior in skill. They recall the rather earlier and more finely executed work in South Africa, especially in those cases where more than one colour is employed on each figure, little blending being attempted. Yet it is equally impossible not to be struck by the general similarity in subject, colour, execution, and spirit of such examples as the author's "medallion" (Plate XX), and some of his archers and dancers, to the more recent paintings on South African burial stones, in particular, for example, the figures on one such stone from Coldstream, Cape Province. This only shows how careful one must be in attempting any cultural connection or dating at this stage: at present it is only wise to record the facts and to collect all possible information about this great African spread of rock-shelter art which we know now so well in the south of the continent (Rhodesia, S. Africa, S.W. Africa) and to some extent, thanks to such publications as this, in the north and east, and which perhaps we meet again in eastern Spain.

The volume concludes with résumés of the author's opinions, ethnographic and otherwise, some of which will be readily acceptable, though others may indeed require modification. But in any case he is very much to be congratulated on having definitely added to our knowledge by setting on permanent record this interesting series of ancient paintings and engravings.

M. C. B.

THE DISCOVERY OF ABYSSINIA BY THE PORTUGUESE IN 1520: a facsimile of the Relation entitled "Carta das novas . . ." Translated and edited by HENRY THOMAS [from] transcription by ARMANDO CORTESÃO. *London: British Museum*, 1938. 12×7½ *inches;* xvi+98 *pages; maps.* £1 2s 6d

CARTA DAS NOVAS QUE VIERAM A EL REI NOSSO SENHOR DO descobrimento do Preste João (Lisboa, 1521). Texto original e estudo crítico . . . By ARMANDO CORTESÃO and HENRY THOMAS. *Lisboa*, 1938. [*London: Maggs Bros.*] 10×7½ *inches;* 176 *pages; plates.* 21s

The only known copy of the 'Cartas das Novas' was secured for the British Museum in 1935. Published at Lisbon, it is undated and without a printer's name, but there is evidence that it was printed by Germain Gaillard, probably in 1521. It is not referred to by later chroniclers, and it is probable that it was suppressed on account of its references to the Coptic Church, a circumstance which would account for its extreme rarity. The pamphlet describes the voyage

of a Portuguese fleet, under Diogo Lopes de Sequeira, from Goa to the Red Sea, in 1520. This was the first direct contact of the Portuguese with the land of Prester John, rumours of which had stimulated in some degree their voyages to the East. The fleet, with the Abyssinian ambassador, Mateus, on board, touched at Massawa and Harkiko, established relations with the local authorities and prepared the way for the embassy of D. Rodrigo de Lima. A considerable part of the text is devoted to the neighbouring monastery of Bizen and the life of the monks. The Portuguese were evidently anxious to establish that the Abyssinians were true Christians.

The British Museum publication contains a facsimile reproduction of the original, a rendering into modern Portuguese, and a vigorous English translation. The Portuguese edition has a transcript of the original text, additional documents on the relations between Portugal, the Papacy, and Abyssinia, and a long introduction in which Senhor Cortesão places the embassy in its historical perspective, and describes the Portuguese contribution to the cartography of the Red Sea. He believes that as early as the time of Prince Henry contact had been established with the land of Prester John. While it seems clear that knowledge of the upper Nile basin was then current in Italy, it is more doubtful how far the Portuguese profited from this, and the evidence for the exchange of embassies is not conclusive. Certainly Portuguese ideas as to the position and extent of the Prester's country remained vague, and as late as 1520 it was still thought that it might extend to the Cape of Good Hope. This impression may have accounted for the later cartographical misrepresentation of the upper Nile basin in the southern extremity of Africa, which has led some to believe in a contemporary knowledge of the Great Lakes basin, though a similar notion is to be found in Duarte Pacheco's 'Esmeraldo.' With regard to the cartography of the Red Sea, the author shows the preponderant share of the Portuguese in its development, and especially the sustained influence of the 'Roteiro' of João de Castro, 1541, which, through the later maps of Pierre Mortier, remained the principal source until late in the eighteenth century. G. R. C.

BANTU BELIEFS AND MAGIC, with particular reference to the Kikuyu and Kamba tribes. . . . By C. W. Hobley. Second edition. *London: H. F. and G. Witherby*, 1938 (*first published in* 1922). 9×5½ *inches;* 368 *pages; illustrations.* 15*s*

The first edition of Mr. Hobley's book appeared in 1922 and was reviewed in the *Journal* for April 1923. Its short title is somewhat misleading, since the subject-matter relates almost entirely to two tribes living in Kenya, the Kikuyu and the Kamba, and the work is not, as might perhaps be anticipated, concerned with the Bantu-speaking peoples as a whole. In its original form it consisted of three parts, two of which, entitled "Natural religion" and "Magic," embraced native conceptions of the supernatural while the third dealt with particular aspects of social organization, jurisprudence, folklore, and tribal life in general, concluding with an illuminating chapter on "East Africa after the War." It is on the lines of these final remarks, which take into account the possible consequences of the impact of European political, religious, and educational ideas on indigeneous norms of conduct (not neglecting the powerful influence of Muhammadanism), that Mr. Hobley has now added a fourth section. This surveys in cautiously prophetic language the present position of the African in relation to the changes in local government that have occurred since the wider application to the East Coast of the policy of Indirect Rule. Justice, the function of native councils, land tenure, taxation, and the squatter problem are among other questions considered, and a commentary on them

by such an experienced observer as the author will be welcome to anthropologists and administrators alike.

In his preface to the second edition Mr. Hobley seems to feel uneasy regarding the effect that recent advances in ethnographical technique may have on the district officer who is genuinely interested in the customs and practices of the folk he administers. Will such an official, he implies, in future be discouraged from attempting to place his observations on record in the fear that highly trained "specialists" are only too eager to pounce on them and expose their theoretical shortcomings; in other words, should the collection of anthropological data be relegated entirely to professional experts? The routine preoccupations of district officers are many, but for such as possess the leisure and enthusiasm for studying the peoples among whom they live it should be remembered that to describe a situation as it actually exists remains the criterion of honest scientific work. Though an expository frame of reference is certainly desirable, no amount of theory can outweigh an unbiassed presentation of facts. An administrator has often far greater opportunities for amassing significant material than the field-worker with a limited time at his disposal, and Mr. Hobley's own contributions to anthropology should be an incentive to his successors to take heart and follow the example he has set for them. J. C. T.

CENTRAL AND SOUTH AMERICA

EXPLORATION EN GUYANE BRÉSILIENNE: Rio Branco—Uraricuera—Parima. By A. HAMILTON RICE. *Paris: Société d'Éditions Géographiques*, 1937. 11 × 8½ *inches;* 88 + CXXXV (*plates*) *pages; illustrations and maps.* 100 *fr*

This volume contains, with some slight additions, a translation of the account which Dr. Hamilton Rice gave to our Society of his extensive exploration of the upper Rio Branco in 1924–25, and which was published in the *Journal* for February, March, and April 1928, though this is not indicated in the text. A Spanish translation having already appeared, the important results of Dr. Hamilton Rice's arduous labours are now easily accessible to those interested in the physical and human geography of this remarkable region of South America. This volume is also worthy of notice for the lavishness of its illustrations, which comprise 135 plates in all and augment considerably those previously published. The maps which accompanied the original paper complete the volume.

JOURNEY TO MANÁOS. By EARL PARKER HANSON. *London: Victor Gollancz*, 1938. 9 × 5½ *inches;* 384 *pages; illustrations and route-maps.* 12*s* 6*d*

This book records the details of the first part of a series of journeys made in the interior of South America by Mr. Hanson in 1931–33, at the instance of the Carnegie Institution of Washington. The Department of Terrestrial Magnetism has, since its inception in 1904, sent out all over the world, and frequently into wild and poorly mapped regions, some two hundred expeditions; like Hanson, most of the scientific observers went alone, gathering and checking material for study.

The author began his journey on the north coast of Venezuela, making first for San Fernando de Apure, down to Ciudad Bolivar, thence up the Orinoco to the river-ports Ayacucho and San Fernando de Atabapo, across the Yavita–Pimichin portage, and finally down the Negro to Manáos; he re-established stations set up by A. D. Power in 1912–14, and made new measurements with the delicate instruments transported through the forest. From Manáos he made several other journeys, into British Guiana, up and down the Madeira-

Mamoré, across to Peru (where the Carnegie maintains, at Huancayo in the Andean uplands, a finely equipped observatory with a permanent staff), Ecuador, and Colombia.

The present volume deals only with the Orinoco-Manáos route, and is good enough reading for one to hope for similar accounts of the later journeys. Mr. Hanson writes easily, relegates science to a few final pages, and presents a running narrative of personal contacts with Venezuelans, Brazilians, fellow-travellers, and Indians; of food and transport difficulties, sickness, and insect plagues. He is one of the travellers who simply do not see any birds or animals, and to him every tree was the same tree. But he inquired keenly into local politics and economics, and reports his ideas in an interesting manner, whether one agrees or not with him regarding colonization in Amazonia. L. E. J.

BLUMENAU: Werden und Wesen einer deutschbrasilianischen Landschaft. By SIEGFRIED ENDRESS. (Schriften des Deutschen Ausland-Instituts Stuttgart. N.R. Bd. 5.) *Ohringen: Ferdinand Rau*, 1938. 9×6 *inches;* 194 *pages; illustrations and maps. M.*4

Dr. Endress hopes by a concise survey of the settlement of Blumenau in the state of Santa Catharina to fill a conspicuous gap in the systematic scientific study of German settlement in south Brazil. German colonization was initiated by a Hamburg company in 1848, and carried on by Dr. Blumenau alone; the first settlers arrived in 1850 and, despite the slow initial progress, Blumenau and district now number 125,000 people, more than half being German speaking. Blumenau chose for his settlement the wooded country between the coast and the uplands; found a site for the town which bears his name at the junction of the Itajahy and the Garcia rivers; and established his colonists in small farms along the valleys of their tributaries. Planned settlement and security of tenure have led to the development of a substantial colony whose prosperity, depending in part on the export of textiles, timber, and agricultural products, has attracted emigrants from other lands, chiefly Italy, and from other parts of Brazil. Dr. Endress provides the necessary introduction to the physical geographical environment; a fuller survey can be found in the work of Dr. Maack (see *Geogr. J.* 92 (1938) 93–94). Residence in the province enables him to contrast the standards of living and methods of cultivation of the German settlers (the bulk of them from northern Germany) with those of other colonists, particularly the Italians who came mainly from Tirol. The study is completed by an appendix of statistics, a critical bibliography (mainly of German sources), and list of maps, a map of the region and a number of plates. The latter are well chosen, but in some it would require the eye of faith to pick out the features so carefully described in the captions. As a regional study on the interaction of race and environment Dr. Endress' work is to be recommended.

J. P. H. M.

PATAGONIAN YEAR. By PEDRO RUBIO. Translated from the Norwegian by ARTHUR G. CHATER. *London: Methuen*, 1938. 7½×5 *inches;* vi+208 *pages; illustrations. 7s 6d*

Pedro Rubio had, before this special year, lived in Argentine Patagonia, and had left it gladly; but there is no doubt that he thoroughly enjoyed this year of return, liking the kind of men he met, the solitude of the semi-desert, the wide and clear skies, and the monotonous and sometimes scant food. Like Hanson in his journey to Manáos, described above, this sojourner in a sharply contrasted part of South America found, despite the dieticians, that fresh meat was more sustaining than herbs and cereals.

Seeking work, the author went to Patagonia as an independent (*i.e.* non-Government) land surveyor, at a time when the opening-up of territory in Patagonia had created many local boundary problems. Camping out, with gaucho helpers, Rubio rode from one district to another, "measuring and marking," and appreciating sincerely the curiously detached life that he led. The cold and wind-swept region had its fascinations; no word of complaint escapes the narrator's pen, when food and shelter failed. He makes an excellent picture of his experiences, scarcely needing the good photographs illustrating the little book. The translator is to be congratulated on preserving a natural and sensitive atmosphere. L. E. J.

AUSTRALASIA AND PACIFIC

LITTLEDENE: a New Zealand rural community. By H. C. D. SOMERSET. *Auckland: Whitcombe and Tombs, Ltd., for New Zealand Council for Educational Research (London: H. Milford)*, 1938. 8½×5½ *inches;* x+102 *pages; illustrations.* 5*s*

Littledene is the fictitious name of a real Canterbury district lying partly in the plains and partly in the foothills of the Southern Alps. It covers just under 350 square miles (the area served for economic and social purposes by one small township), has a population of about 1800, and comprises 350 farm holdings ranging from small dairy farms of less than 20 acres to large sheep-runs of thousands of acres in the high country. Here, then, is rural Canterbury in microcosm. Mr. Somerset's study of this area is avowedly sociological and includes such topics as recreation and education, but two aspects of his work are of direct use to the economic geographer. In the first place his study of farming organization and farm work, based on personal investigation of selected farms, is extraordinarily thorough, and fills a marked gap in the literature available. In the second place—less obvious, for it is nowhere explicit—there is the author's demonstration of the urban character of Littledene nuclear settlement. Apparently it has a population of only about three hundred, and yet its list of public buildings, hotels, shops, stores, and offices is impressive. In this, though not in all things, it is the typical township of New Zealand, where the village, in the English sense, does not exist, and the very word "village" is absent from the ordinary vocabulary. It is, too, perfectly in proportion in a country where towns with populations of from 100,000 to 250,000 have assumed metropolitan functions. This is indeed an excellent little book, and it is greatly to be hoped that further local studies of similar calibre will appear. R. O. B.

POLAR REGIONS

BEYOND HORIZONS. By Lieutenant-Commander LINCOLN ELLSWORTH. *London: William Heinemann, Ltd.*, 1938. 8½×5½ *inches;* xii+384 *pages; illustrations.* 12*s* 6*d*

"I am frankly a hero worshipper and a sentimentalist," writes Mr. Lincoln Ellsworth, in the course of this autobiography. The phrase is no doubt true, but it is apt to give a false impression of its subject unless one knows that his hero worship expresses itself in lively emulation, while his sentimentalism has caused him to spend a fortune and risk his life in the attainment of an idea. So, two normally passive qualities have been spurs of a most active life.

Roald Amundsen was one of his heroes. Mr. Ellsworth had already begun an exploring life (although not in the Arctic of which he had dreamed the most)

when he read in the newspaper that Amundsen had arrived in New York on a lecture tour. On the spot he rang him up to arrange an interview; and from the first meeting there blossomed a friendship which led to the association of the two men in their flight from Spitsbergen towards the North Pole in 1925 and to the flight of *Norge* across the Polar basin which they made the following year, in company with General Nobile.

The flight of 1925 must have been a stirring first experience of the north. The two aeroplanes, it will be remembered, came down in the pack-ice. One of them was damaged beyond repair and the other had no chance of taking off with its double load until a suitable run-way had been made. Yet again and again long hours of work were destroyed in a moment by a sudden change of pressure in the ice. Mr. Ellsworth pays a warm tribute to his companions, to Amundsen, and to Riiser-Larsen, the calm, massive pilot who expressed no word of either fear or hope. In fact, a very pleasant aspect of the book is its complete lack of that self-justification or the criticism of companions which have marred similar works in the past. Inevitably Mr. Ellsworth has disagreed with several companions in the course of his exploring life, but he tells of these incidents frankly and without bitterness, as part of the story, and never without a tribute to the qualities of the men with whom he disagreed.

The second half of the book is concerned with Mr. Ellsworth's work as leader of his own independent expeditions, the three years he spent in his ultimately successful attempt to fly across the Antarctic continent. That flight was a truly remarkable one. He was determined not to turn back for bad weather. Instead he would land and wait until it had blown over: a bold plan when one considers that snow is the most deceptive landing medium, and Antarctic distances would almost certainly have made impracticable any escape journey on foot. The plan succeeded. Four landings were made (Mr. Hollick-Kenyon, the pilot, was "a wizzard with the controls"): and so they avoided flying in bad weather.

Mr. Lincoln Ellsworth has richly fulfilled his ambition to see lands which no other eyes have ever seen. To others may go the credit for accurate map-making, for the type of work he has chosen has always been without ground control. But he has earned a place among the pioneers. Both Poles have been reached by other aviators and aerial exploration of the polar regions is being developed every year. But it must be remembered that Mr. Ellsworth was one of the first in the field.

By an oversight in producing the American edition, repeated in the English, the content of Appendices I, II, and III has in a preliminary page of acknowledgment been attributed to the American Geographical Society, though correctly described in the heading of Appendix I as from the *Geographical Journal*.

J. M. S.

THE CRADLE OF THE NORTH WIND. By A. S. T. GODFREY. *London: Methuen and Co.*, 1938. 8×5 *inches;* xii+234 *pages; maps and portrait.* 8*s* 6*d*

As the author writes in his preface, this is a personal and egotistical account of the Oxford University Expedition of 1935–36 to North East Land, which he joined "for adventure and enjoyment." Besides a general account of the expedition, the book contains many entertaining descriptions of the personal reactions and feelings of the members of the party. Its very frankness in this respect makes it the more interesting to anyone who wishes to appreciate recent trends in polar exploration, but unfortunately the reader may gain an impression of the "toughness" of these University expeditions which is not altogether true.

It would be more serious however if future travellers were to follow some of

the methods advocated. For example, is it really surprising that the author should describe his sledge dogs as "more than half mad," when in the next page he adds that "the slightest slackness in pulling is visited with the most brutal thrashing. You do not just lash them over the back with a whip, but seize them by the scruff of the neck and beat them over the head and nose with the butt-end until they are thoroughly frightened." Apart from any question of brutality, one would suppose that after his considerable experience in the Arctic, the author would have discovered that dogs work far better under different treatment. If this is the way in which he felt obliged to train his dogs there is nothing to be gained by talking about it. Unthinking suggestions that primitive methods are best can only discredit exploration, and parts of this book indicate either the author's inability to get the best out of his dogs or an unpleasant desire for sensationalism.

Spitsbergen should be spelt with an *s*, not a *z*: the name is Dutch, not German, and the second *s* asserts and commemorates the nationality of the discoverer.

Apart from blemishes of this type, the book is interesting and full of humour.

B. B. R.

PHYSICAL AND BIOLOGICAL GEOGRAPHY

DIE ENTWICKLUNG DER KONTINENTE UND IHRER LEBEWELT.

By THEODOR ARLDT. Zweite . . . Auflage. I. Band. Zweiter Teil (with title-page and contents, completing volume). *Berlin: Borntraeger*, 1938. $10^1_2 \times 7$ *inches;* xviii+449–1006 *pages; maps and diagrams. M.*44

By the issue of this completing part of vol. I the criticisms in the review of the first part (*Geogr. J.* 90 (1937) 83–4) are met. There is now a synopsis of the contents and a summary of conclusions, and it may be supposed that the second volume will deal more fully with questions of general theory.

As a work of documentation this volume is unparalleled. Wallace sixty years ago tabulated the geographical distribution of land-vertebrates so thoroughly that only annotations are needed to bring his work up to date. But no one has hitherto attempted to tabulate the whole geographical and geological distribution of all the land and freshwater faunas and floras of the world. Undertaken by one man this involves colossal labour, and rouses suspicion of possible unequal treatment of different faunal elements. Only a jury of specialists could determine whether such suspicion is justified or not; but, so far as the reviewer's special knowledge goes, he can find no ground for it.

In order to combine geological with geographical distribution, the author divides the flora and fauna of each great region into "layers" (*Schichten*) according to the presumed dates of entry into the region. Thus the Ethiopian fauna and flora are divided into Tritylodon-, Hyracoiden-, Viverriden-, and Antilopiden-*schichten*. In view of the imperfection of the palaeontological record, such divisions are largely theoretical and arbitrary; nevertheless they are provisionally justifiable, as they help towards picturing the history of a faunal and floral complex, and specialists can correct the details to taste.

The numerous distribution and migration maps are too complex to appeal directly to the eye. The serious student will obtain a clearer view by transferring the details on to a series of separate maps. As a standard work of reference this is likely to have as long a life as Wallace's, unless some revolutionary geological discoveries should intervene.

A. M. D.

HANDBUCH DER KLIMATOLOGIE. Edited by W. KÖPPEN and R. GEIGER. Band II. Teil J. The climates of North America. [Second and concluding section] Canada. By A. J. CONNOR. *Berlin: Borntraeger*, 1938. $10\frac{1}{2} \times 7$ *inches;* 333–424+x *pages* (*title-page and index to Band II, Teil J*); *maps*. *M*.10.70 (*subscription*)

Mr. Connor has throughout insisted upon the great complexity of the Canadian climate, a fact often overlooked on this side of the Atlantic. Prominence is given to the effect of local geographical features on the atmospheric circulation in modifying spells of cold and heat, and the interpretation of Canadian weather in the light of modern frontology represents a great advance on earlier work. Charts show the crowding of cyclone tracks in the vicinity of the St. Lawrence, where especially in winter there is close juxtaposition of warm with very cold air masses. Interesting peculiarities of climate are brought out, such as the liability of the province of Ontario to great summer heat with a widespread temperature of over 100° F., the large variability of the prairie winters from one year to another, and the presence of a very dry area in the south-western prairies not easy to explain. Precipitation figures are stated to be doubtful owing to the large proportion of snow in Canada. In the far north almost continuous drifting of snow occurs during the cold season, large areas being left entirely barren of snow while gullies are filled to considerable depth.

Average values of elements are given in tables for a number of stations, but there are no statistics for thunder or hail. There is practically no reference in the text to the severe thunder and hailstorms which do so much damage to crops in the plains. In some respects indeed the treatment is not so satisfactory as that in C. E. Koeppe's work on the climate of Canada (*Geogr. J.* 80 (1932) 78).

L. C. W. B.

ECONOMIC AND HISTORICAL GEOGRAPHY

THE SYNTHETIC OPTIMUM OF POPULATION. By IMRE FERENCZI. (International Studies Conference.) *Paris: International Institute of Intellectual Co-operation, League of Nations*, 1938. $9\frac{1}{2} \times 6$ *inches;* 116 *pages*

The peaceful solution of economic, social, and territorial problems is inevitably related to questions of population, migration, and colonization, and Dr. Ferenczi therefore prepared this monograph as part of the equipment of delegates to the International Studies Conference held in Paris last year. It is of exceptional interest at the present time and, written with admirable detachment, sheds a vivid if discreet light on many aspects of current international affairs.

The existing contrasts in density of population, in rates of growth of population, and in demographic policies are among the vital causes of the danger of war. Against the Malthusian doctrine of the limitation by resources of the increase of population is set the theory of the optimum density of population which, it is held, should ultimately be attainable through national and international policies. While it is impossible to assess statistically the optimum world population, the recognition of overpopulation and underpopulation has made considerable progress. Poland has an excess of agricultural population estimated at nine millions, and "it seems scarcely possible to obtain a rapid extension of smallholdings through agrarian reform and at the same time to introduce more intensive types of cultivation because of lack of capital, insufficient occupational training, etc." (p. 29). The growth of industry is insufficient to make up for want of capital, raw materials, and outlets; and emigration now provides little relief. The result is "a growing undernourishment of the agricultural population which is menacing the physical qualities of the Polish people" (p. 30). Equally serious

is the situation in Hungary, where three and a half millions live on the verge of starvation. The overpopulation of parts of China and India is well known, yet we are told that "fifty-five per cent. of the latter's resources are unexploited" (p. 34). Other countries are actually or potentially underpopulated and in these, as in overpopulated countries, there may exist a danger of famine, or decline in material standards of living, with a growing amount of undernourishment.

The essential problem is therefore the distribution of population, and the influences bearing upon it are far wider than those which concern the geographer. Dr. Ferenczi considers the various aspects of optimum population in terms of the economic life and welfare of various countries and of social factors influencing countries in their international relations. He also deals with the demographic and biological optimum and gives an interesting treatment of "milieu, racial hygiene, and 'racism.'" Many conclusions and suggestions for future research emerge, such as the value of an international survey of the demographic situation in a certain number of typical countries, of migration in its various aspects, of the situation of foreign workers, and the study of colonial problems.

The scope of the monograph is much wider than it is possible to indicate in a brief review. Its value lies in the exposition, with adequate references and footnotes rich in information, of a type of problem which can be treated adequately only by an international organization of specialist workers, among whom geographers should be represented. T. W. F.

GENERAL

THE GOLDEN ROAD: an anthology of travel. Selected and arranged by ARTHUR STANLEY. *London: J. M. Dent and Sons, Ltd.*, 1938. $7\frac{1}{2} \times 4\frac{1}{2}$ *inches;* xii + 624 *pages; drawings by Phyllis Bray.* 7*s* 6*d*

For his success in so ambitious an attempt the editor of this anthology is to be congratulated. Nearly all the great travellers of antiquity, the Middle Ages, and the Renaissance are represented, and of these the older continents claim their full share. The Americas are represented only by modern travellers; the journeys of the *conquistadores* and the missionaries have received less attention. Australasia is almost disregarded. Sir John Chardin, one of the most delightful of travellers, has been crowded out, and so has J. J. Rousseau. The individual reader may think of others whom he would like to have seen included, but this is a book of travel rather than of exploration, and it would be ungenerous to cavil. The grouping of the selections in chapters is inspired, and breaks the monotony which too often accompanies a mere series of extracts.

ABANDON SHIP! By Vice-Admiral GORDON CAMPBELL, V.C. *London: Hodder and Stoughton*, 1938. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* 318 *pages; illustrations and facsimile maps.* 7*s* 6*d*

The five stories of shipwreck which the author relates have been told before; one, of the wrecks of the *St. George* and the *Defence* on the west coast of Jutland in 1811 has been recently recalled to mind by the erection of a memorial to the many who lost their lives at Thorsminde. Perhaps the most interesting account is that of the wreck of the *Antelope*, which took place in 1783 at Aulong, in the West Caroline Islands. During the months when a new ship was being built, the survivors played an important part in local politics, and various narratives of their adventures have survived. The author has endeavoured as far as possible not only to check previous accounts but to obtain new material. The stories themselves need no embellishment, and he has been content to relate them in simple and straightforward fashion.

THE MONTHLY RECORD

THE EVOLUTION OF SHORELINE CURVES

"The evolution of shoreline curves," by W. V. Lewis, appearing in vol. XLIX of the *Proceedings* of the Geologists' Association, is a development of the subject of earlier papers by the same author which have appeared in the *Journal*.[1]

Mr. Lewis in his latest contribution to the study of coastal topography finds himself in close agreement with early authorities, such as Sir Henry de la Beche and de Beaumont, in recognizing the importance of wave action and the intimate connection between the direction of dominant waves and shore outline. In contrast, he does not find that the influence of longshore currents, in either of the extreme forms hypothesized by de Martonne and Hobbs respectively, offers an adequate explanation of the evolution of a coastal outline. Mr. Lewis stresses the importance of the correspondence between the direction of dominant breakers and shingle embankments. In order to appreciate fully this correspondence it is necessary also to ascertain the approach of the prevalent waves, for, as he says, "the direction of the dominant breakers is determined in part by that of the dominant waves some distance offshore, in part by the position of the neighbouring headlands, and in a large measure by the actual run of the shore itself."

A wide range of factors is thus brought under discussion, and Mr. Lewis deals with them in their application to specific examples chosen mainly from the southern and western coasts of Great Britain. Many of the features of the southern coast of England from Portsmouth Harbour to the Chesil Bank are described in detail, and the description of the Hurst Castle Spit and Chesil Bank, as outlined in the earlier paper on the effect of wave incidence on a shingle beach, is here amplified. Many features of the Cardigan Bay coast of Wales are discussed, special reference being made to the two bays of Aberdaron and Porth Neigwl, the Harlech Sand Spit, Dyffryn Foreland, and Fairbourne Spit. In the Bristol Channel, sections of both the Welsh and English shores are described in the Weston-super-Mare and Barry districts respectively. Finally, in Scotland, the generally corroborative evidence of Professor Ogilvie, as outlined in 'The physiography of the Moray Firth coast,' is briefly considered.

LONGITUDE DETERMINATION AND THE WESTERLY DRIFT OF GREENLAND

A line of evidence originally invoked by Alfred Wegener to support the hypothesis of the drifting movement of continents was a supposed change in the determined longitude of certain stations in north-east Greenland. In the course of time Wegener's theory has found some support and justification in other facts, but the postulated motion of Greenland has remained a matter for discussion on its own merits.

The original observations from which the discussion springs were made in 1870 and 1907 respectively by Börgen of the *Germania* expedition and J. P. Koch of the *Danmark* expedition. Koch's value for the longitude of Börgen's station differed by 10 seconds of time in a westerly direction from the earlier determination: in his opinion this discrepancy could only be explained by Wegener's hypothesis of an actual displacement of Greenland with respect

[1] Notably "The effect of wave incidence on the configuration of a shingle beach" (*Geogr. J.* 78 (1931) 129) and "Nivation, river grading, and shoreline development in south-east Iceland" (*Geogr. J.* 88 (1936) 431).

to the meridian of Greenwich. In 1921, some years after the publication of the Greenland results, Dr. F. Burmeister, of Munich (*Petermanns M.*, October 1921), examined Koch's claim that the observational errors alone could not account for the discrepancy of 10 seconds. The method which had been adopted in both determinations was that of moon culminations, a method in which both observational uncertainties and those due to uncertainties in the corrections to the ephemeris cause considerable uncertainty in the result. For this method under the conditions of north-east Greenland, Dr. Burmeister held that a discrepancy of 10 seconds was explainable without recourse to hypothesis.

In 1922 an important expedition under the late Lieut.-Colonel P. F. Jensen was sent to west Greenland by the Danish Geodetic Institute with the definite purpose of making a longitude observation to test Wegener's hypothesis. Local time was determined by star transits in a precise theodolite, and time signals from Nauen. The final values were greater by 5 seconds of time than the mean of the earlier observations by moon culminations in 1863 and 1883. Colonel Jensen in this result claimed to have found support for the drift hypothesis.

But again the value of longitudes by moon culminations was challenged, this time by Colonel Sir Charles Close, who (*Geogr. J.* 63 (1924) 147) wrote: "If we assume that the determination of 1922 is relatively errorless, the only lesson that could safely be derived from the comparison would be that the mean of eighteen values of longitude derived from moon culminations was about 5 seconds in error—a very likely result. This seems to be the proper conclusion, and not that Greenland is moving westward at the rate of 20 metres a year."

In the course of a general discussion of longitude determination Professor Nørlund (*Monthly Notices* R.A.S., 97.7.506, 1937) published the results of two recent first-class longitude determinations. Observations were made at a station in west Greenland (Kornok, near Godthaab) in 1927 and 1936 with first-class transit instruments mounted on a pillar, recorded on a chronograph checked by wireless signals. The two determinations gave practically the same result. "It is most likely," writes Professor Nørlund, "that the deviations of the old observations from the new ones are the result of observation errors." This result confirms Sir Charles Close's criticism of the evidence previously used by Wegener and in some degree accepted by the Danish Geodetic Institute.

M. A. S.

CLIMATOLOGICAL NORMALS FOR EGYPT AND SUDAN

The Ministry of Public Works, Egypt, Physical Department, has this year issued "Climatological normals for Egypt and the Sudan, Cyprus and Palestine" based on nearly a hundred meteorological stations and over a hundred additional rainfall stations. The tabular matter is prefaced by a well-illustrated introduction which brings out a number of interesting points. Thus at Helwan observatory, a desert station some fifteen miles to the south of Cairo where conditions of observations have remained uniform since 1904, there has been a definite rise of temperature in recent years: for whereas the mean temperature for the first five years, 1904–08, was 20·9° C., that for the middle five years was 21·3° C., and for the last five years included in this volume, 1930–34, was 21·9° C. The Helwan observatory was previously established at Abbassia, a suburb of Cairo, where the records show that temperature declined between 1869 and 1893, but subsequently rose till 1922, when a second-order meteorological station which had been installed after the removal of the observatory to Helwan was closed down. In Egypt when the temperature over a period of a month or more is abnormally high, the barometric pressure is abnormally low, and

conversely. From 1903 to 1921 a striking parallelism was maintained between the seasonal winter rainfall of northern Egypt and the following seasonal summer rainfall in the central Sudan, such that when rainfall in the former region in one season exceeded that in the previous winter season, rainfall in the latter region usually also exceeded that of the previous summer season. This correlation however broke down badly after 1921 just when hope was beginning to be entertained that it might be useful in forecasting the Sudan rainfall. The diurnal variation of wind velocity presents some interesting contrasts. At Salum, Alexandra, and Cairo the diurnal variation is of the common type, the wind increasing steadily from about sunrise to a maximum in the afternoon. At Helwan, except in the winter, the maximum is not reached till nine in the evening, and at Suez the course is similar. At Khartoum and over a large area in the Sudan the behaviour is quite different, the wind increasing rapidly after sunrise to its maximum at nine in the morning and falling slowly to its minimum soon after sunset.

In addition to air-temperature observations in standard screens a good deal of attention has been given at some stations to earth temperature, surface temperature, and river temperature. It is interesting to note that a surface temperature, presumably in full sunshine, as high as 66° C. (151° F.) was recorded in July 1922 at Giza, near Cairo, in undisturbed fallow land receiving no water by rain or irrigation.

THE MONSOON AND MOUNT EVEREST

A paper by Dr. Sen, of the Indian Meteorological Department ("Long-range forecasting of the south-west monsoon and Everest expeditions," *Science and Culture*, June 1937), analyses the nature of the monsoon front and discusses the possibility of an early forecast of the probable break of the rains. Dr. Sen's researches indicate that even with such information as is at present available it should be possible by February to foresee any exceptional acceleration or retardation of the normal advance of the rains of the same year.

It is important to realize that the Himalaya project into a zone usually described as the "upper air." This means that forecasting must be based on more than the usual considerations for land at sea-level; it also means that the mountains themselves influence the movement of air masses in a way that is still imperfectly understood on account of the paucity of observations. During the northern winter a deep mass of air of Himalayan origin becomes established over the Indian peninsula. The principal agent to displace this and destroy its stability is the equatorial air, which advances northwards in the summer. This air is damp and in winter warmer than the continental air; in summer it is cooler, although at a certain height it becomes virtually warmer. Two other air masses, the African air from the west, and the Eastern Himalayan from the north-east, complicate the actual state of affairs.

The equatorial air is hotter than the continental air at the so-called transition layer; the height of the transition layer is of decisive importance. Generally speaking, the greater the height of the layer, the more pronounced the energy of the advancing monsoon front and the more likely the development of depressions which will bring deep masses of maritime air to the foot of the Himalaya.

Dr. Sen's interest in the subject began when he was appointed to supply Dyhrenfurth's expedition of 1930 with weather reports. Since then he has been responsible for advising Mount Everest and other Himalayan expeditions about weather conditions with, as he rightly claims, some success in prognosis. Wager, for instance, has written: "Weather bulletins of the sort received in 1933 would be of great value to future expeditions now that some faith in their validity has

been built up." This is in spite of the fact that the whole vast area of the Eastern Himalayan region contains only one high-level surface observatory, namely Darjeeling. By comparing forecast with results, and by examining the history of monsoon seasons in retrospect, he has reached an analysis in terms of the main air masses which move over India. This is an interesting secondary result of the Mount Everest expeditions.

The year 1933 will be remembered as one in which the monsoon broke early, though not as early as in either of the years 1936 or 1938. In 1935, on the other hand, the reconnaissance party, appointed to examine monsoon conditions, found that the bad weather arrived so late that the year would have been a very suitable one in which to attempt the mountain. As soon as these two results were known Dr. Sen set about preparing the present paper, which therefore contains no reference to the season of 1936, remarkable for the development of depressions in front of the monsoon. The true upper-air observations available for discussion are very few, and the principal evidence for the distribution of the air masses as indicated in the charts is obtained from surface, *i.e.* indirect, evidence. But the evidence is sufficient to show that in 1933, when the monsoon broke in Bengal on May 22, equatorial air had already infiltrated over the plains as early as February. By June of the same year the tropical air mass was at least 20,000 feet deep over the Gangetic plain. The year 1935 had an unusually late monsoon: in February the Himalayan current extended over the whole length of the Himalaya and as far south as central India. The current maintained its strength so that by June the advance of the equatorial current was still checked except over upper Bengal.

A more extended programme of upper-air observations would enable this interesting problem to be examined to much greater advantage both to science and to the climbers. From the scientific point of view the interest is mainly theoretical, since it is hardly likely that the Indian villager would be either able or well advised to modify his agriculture to the official prognosis. But the climbers could very well make use of reliable information available in February of the year in which the climb is to be carried out. To make such a forecast reliable further researches will have to be made, supported by balloon ascents in the Himalayan regions. One may hope that it will be possible to continue this study of the air masses on whose interaction to cause monsoonal rain the livelihood of India depends.

A NATIONAL LANGUAGE FOR THE PHILIPPINES

About eighty-seven native languages and dialects are spoken in the Philippines, of which seven are of leading importance. The principal native languages belong to the Malayan group, but they have all been more or less corrupted by Chinese, English, and Spanish. Unlike the Dutch, who encourage the use of native languages in the East Indies, the Americans encouraged that of English throughout the Philippines. The present linguistic situation resembles that of Malta. English is the predominant official language, spoken by about two million of the thirteen million inhabitants of the group, but Spanish, spoken by less than three-quarters of a million, is extensively used, especially in the law courts, and is favoured in social intercourse. English as spoken in the Philippines is said to have "an accent, tonal expression, and rhythm that are thoroughly Malay."

In accordance with Section 3, Article xiii, of the Constitution of the Philippines, providing that the National Assembly shall take steps for the development and adoption of a national language based on one of the existing native languages, Commonwealth Act No. 184 was passed by the National Assembly, and approved

by the President on 13 November 1936. The Act established the National Language Institute, which functions in close cooperation with the Department of Public Instruction. The Institute consists of a president and six members, each representing one of the principal linguistic groups of the Philippines. Its first duty was to make a systematic study of the native languages spoken by at least half a million Filipinos, and to select from them a language suitable for development into a national language. In compliance with Section 7 of the Act, the Institute recommended Tagalog, the language of one and a half million people in southern Luzon. The President of the Commonwealth of the Philippines approved the recommendation, and proclaimed on 30 December 1937 that Tagalog is to form the basis of the national language. The work of the Institute is now to prepare a national grammar and dictionary. The vocabulary and syntax of Tagalog are to be enriched by the absorption of necessary words and constructions, primarily from related sources in the other important native languages. Words may be taken, if necessary, from English and Spanish, and indispensable new terms may be coined from Greek and Latin roots. Foreign words are to be assimilated to Philippine phonetics and orthography, but all unnecessary foreign elements now existing in the sources of the national language are to be eliminated. The grammar and dictionary are to be published within two years of the proclamation of Tagalog as the basis of the language. The President of the Commonwealth of the Philippines will then decide when the teaching of the language is to be introduced into the schools, and the decisions of the Institute, subject to the approval of the Secretary of Public Instruction, are then to be adopted as literary standards in all official publications and school texts. Meanwhile, in accordance with the provisions of the Constitution, English and Spanish shall continue to be the official languages of the Philippines until otherwise provided by law. M. A.

OBITUARY

CAVALIERE FILIPPO DE FILIPPI, K.C.I.E.

It is with profound regret that we record the death of Cav. Filippo De Filippi. One of the foremost travellers and writers of our time has gone. His name will for ever be associated with that of his compatriot and friend, His late R.H. the Duke of the Abruzzi, the most uniformly successful explorer of his generation. De Filippi's success was due to his possession of all three of the essential attributes of the successful traveller: the insight of the born explorer in choosing his objective; great powers of organization; and the scholarship of a cultivated mind.

Born at Turin in 1869, he studied medicine at that University and later was appointed to the staff of the University of Bologna. His vacations were spent in the Alps, and he soon developed into a fine mountaineer, for his very short stature concealed the toughest of constitutions. Later he worked at biological chemistry in Germany and Austria, and at pathology in Rome. His alpine activities and papers in the *Italian Alpine Journal*, combined with his medical and scientific reputation, led to his being invited by the Duke of the Abruzzi to accompany him to Mount St. Elias in Alaska in 1897. With his leader he reached the summit, and was the author of the book published on the expedition in Italian and English. In 1903 he visited the Caucasus and Bokhara. In 1908

he published the account of the Duke's successful expedition to Ruwenzori which was translated into English, German, and Spanish.

In 1909 he accompanied the Duke and his expedition to the Karakoram and wrote the volume describing this campaign. On this expedition, hardly less arduous than that to Mount St. Elias, he was the Duke's right-hand man. What he saw of the Karakoram during this visit really started him on his own greatest undertaking, his scientific expedition to the Karakoram in 1913–14. This was undertaken under the auspices of the Government of India and, but for the War, would have been continued into central Asia in 1915. Besides the exploration of the then unknown sources of the Yarkand river and of the basin of the Remu glacier, one of his main objectives was to connect the Magnetic Survey Stations of India with those of Russian Turkistan. Abruptly terminated though it was, the scientific results of this great expedition filled sixteen quarto volumes, published between 1922 and 1935, and formed a mine of scientific information.

He served in the War as Lieutenant-Colonel superintending Medical Organization. From 1917 to 1919 he directed the Italian information and propaganda services in England.

De Filippi was an Honorary Member of our Society, of the Alpine Club, and of most of the geographical societies of the world. He received our Patron's Medal in 1915 and the gold medals of the Italian, French, and American Geographical Societies. He was appointed Knight of the Crown of Italy in 1911 and received the honour of K.C.I.E., rarely bestowed on foreign subjects, in 1916. For the War he had the Cross of Merit and other decorations. He was General Secretary of the International Geographical Union from 1928 to 1931. He was the author of many publications in Italian, English, and German.

A good Italian, but cosmopolitan in the best sense of the word, he had a wide circle of friends in Europe and America. He was a member of the Athenaeum and of St. James's Club. Many of his friends retain the most delightful memories of his hospitality at La Capponcina, his villa at Settignano on the outskirts of Florence, and at his châlet in the lovely alpine valley of Gressoney.

He was a man of wide tolerance of view. Refusing formally to join the Fascist party, for he was a man of very strong personal opinions, he would always maintain to English critics that no alternative form of government was possible for Italy. His refusal did not prevent Signor Mussolini from bestowing on him the Premio d'Italia for science in 1931, the first year it was awarded and when there was naturally a great number of candidates available for the honour. His cynical realism was always combined with a profound sympathy for humanity. The War indemnities were "astronomical"; sanctions were "fantastic"; but all the time one realized that England had no truer friend. It was typical of his character that when quizzed in Italy for publishing his most scholarly work on Desideri in English instead of in Italian, he violently retorted that he wanted to sell it and knew his market better than any one else.

In 1901 he married Caroline, daughter of Mr. William John Fitzgerald, a most talented lady. He never got over her death ten years later, and remained devoted to her memory. He lost his brother Ludovico, who went down in the battleship he commanded, sunk by a mine at the end of the War. His sister-in-law and her daughters came to live at Settignano and were the most charming of hostesses to his numerous visitors in later years.

To have known De Filippi intimately was an education in itself. He was a scholar and a gentleman. To his relations, as to his friends, we offer our sincerest sympathy.

T. G. L.

MEETINGS: SESSION 1938–39

First Evening Meeting, 31 October 1938. Professor Kenneth Mason, Vice-President, in the Chair

Paper: The Mount Everest expedition of 1938. By Mr. H. W. Tilman

First Afternoon Meeting, 7 November 1938. Admiral Sir William Goodenough, Vice-President, in the Chair

Paper: Climate, irrigation, and early man in the Hadhramaut. By Miss Gertrude Caton-Thompson

Second Evening Meeting, 14 November 1938. Professor Kenneth Mason, Vice-President, in the Chair

Elections: Thomas Adair; Robert Adeane; Henry Maxwell Andrews; Miss Marjorie O. Appleton; David Henry Lewis-Aptrevor; John Wishart Baird; Miss Ethel Beaumont; Alfred George Billing; Doctor Hans Bobek; Miss Ursula Graham Bower; David P. Brachi; Miss Elsie Broadie; Mrs. Morwenna Mary Andalusia Brocklebank; Carl Brunning; George Herbert Cuming Butler; Mrs. Patricia Byron; Erach Hormasji Canteenwala; F. G. G. Carr; John Chaplin; Denzil Stanley Charleston, M.A.; Major Geoffrey Combe; Miss Ursula Corning; Arthur Ernest Crabtree; Miss Doreen Cummins, B.A. Alexander Tancred Curle, M.B.E.; William Twiston Davies, M.C.; The Vicomtesse de Janzé; John de Laszlo; J. H. Dick; Mrs. Dorothy Helen Dunning; George Durston; Rev. Dennis Edward Joseph Earle; Rev. William Cecil Eccleston; Lieutenant N. Scott Elliott, R.N.; Wing-Commander Thomas Walker Elmhirst, A.F.C.; Miss Jean Orr-Ewing; Mrs. Nesta Fanshawe; Miss Muriel Denton Firth; F. C. T. Forder; Bernard Cecil Frost; James O'Malley Gaunt; Lady Diana Gibb; Charles Anthony Gilkison; Doctor Nelson Glueck; Miss Isabella Graham; Miss Mignonne Louise Julia Hartwell; Edgar Henke, B.SC.; Rev. J. R. Higgs; Edward Noel McLachlan Hogben; Miss Barbara M. R. Hunt; Doctor Reginald William Ironside, M.B., B.CH.; Stephen Guy Burnet James; Geoffrey John Charles Crozier Jenkins Bey; Douglas Johnson; W. I. W. Johnston, B.SC.; Miss M. B. Heys-Jones, M.A.; Doctor Herbert Rudolf Gustav Kaltenbach; Miss Muriel Eunice Kendall, B.A.; Miss Mary R. Lambert, M.A.; R. G. Norman Lewis; Peter Geoffrey Lubbock; Miss Sonia B. McKenna; Homi Manekji Paydiwalla; Rev. Harry Marshall; Lieut.-Commander William Bonnar Monk, R.N.; Doctor Geoffrey Wilson Morey; R. K. Nayar, B.A.; Miss E. M. Ness; George C. Odom; Captain Alfred Brian Palmer; Edward Thomas Palmer, M.A.; Paul Richard Peirano; George W. Pirie; Mrs. Victoria Prestage; Doctor Raymond E. Priestley, M.C., M.A.; Miss Christine Blanche Richards, M.A.; Charles H. Roberts; Charles Raymond Sawyer; Miss Priscilla Sarah Frances Sharland; Philip Archer-Shee; Steuart William Sillem; Michael Simons; J. J. Smith; Robert Walter Steel; Arthur Rodney Bayford Stone; John Orr Strathdee; J. C. Stuttard, B.A.; Robert Swyer; The Right Hon. Lord Tennyson; Albert Vincent Thomas, B.SC.; Harold Stewart Thurston, B.SC.; Lieut.-Colonel Harry Walter Tobin, D.S.O., O.B.E.; Miss Hilda Trefusis; Rev. John Hope Urwin; Miss Brenda Van De Weyer; Eugene Cecil Van Wyk; James Peters Veale; Albert Basil Verbi; Charles Willoughby Waddington, C.I.E., M.V.O., M.A.; John Waechter; Mrs. Marion Inez Douglas Ward; William Hallam Ward; Evelyn Waugh; Wee Kwee Hai; Charles Matthew Newton White; Ernest L. Wilkinson; John Henry Williams; Maurice M. Williamson, L.D.S., ENG.

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